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VOLUME 35 NUMBER 2

FEBRUARY 1942

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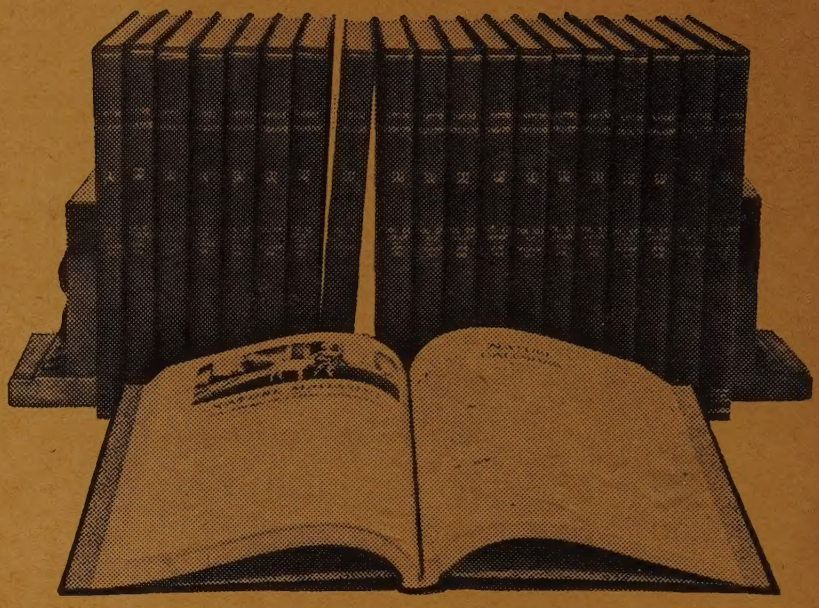

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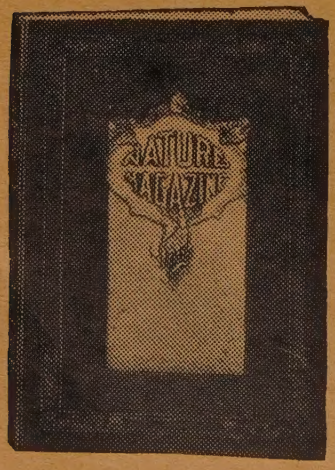

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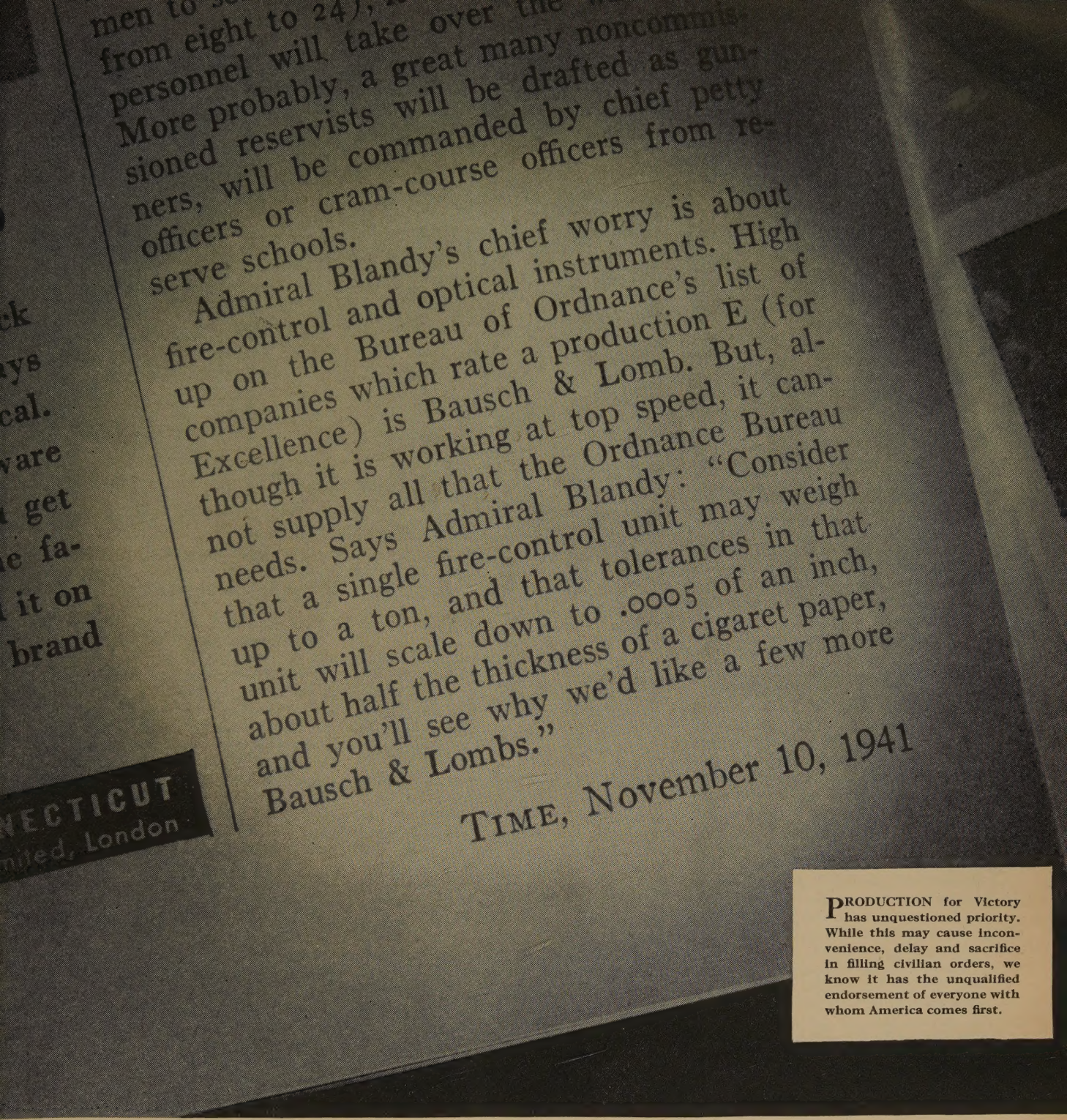
men to
from eight to 24),
personnel will take over the
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TIME, November 10, 1941
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Camera Trails

BY NORRIS W. HARKNESS

The Amateur Photographer in War Time

The position of the amateur photographer in days like these is a peculiar one. A few regard his avocation as a luxury that need not be considered in the general scheme and wish to hamper his activities if not eliminate them altogether, but wiser heads realize the value of photography as a builder of civilian morale, and a maintainer of the spirit that keeps hearts high.

If the devil finds work for idle hands, how much more will rumor and propaganda find place in the mind that is no longer occupied with the problems and fascination of a hobby that calls perpetually for more and more practice. With radios pouring out war news bulletins and the days filled with extra effort of all kinds, we need the relaxation that comes from concentrating on a beloved task that needs our best thought and best skill. In justice to our communities and to ourselves we cannot afford to give up photography.

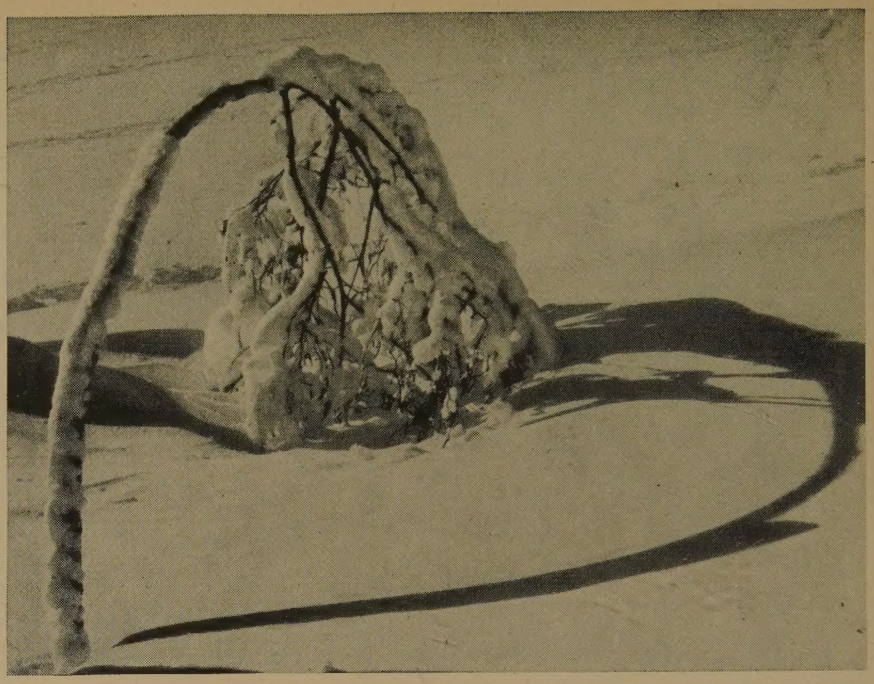
This does not mean that we should adopt a "business as usual" attitude. Possible material shortages and the needs of the military for things we regularly use may curtail the work of those who turn out large quantities of prints, and many of our customary subjects now come under the head of military secrets that cannot be photographed. Work as civilian aids in all capacities will take much of our time and the combination of less time and a decreased supply of materials will, in many cases, result in fewer exposures and fewer prints, but the wise American will go on with his camera work whenever the opportunity presents itself.

In addition to its value in the less tangible ways, amateur photography has its practical applications. If we go to our library and hunt for pictures that tell the story of World War I, we will find few of them. The organization of the local guard unit is nothing more than a list of its members, and the farmerettes are a memory. The activities for Liberty Loan drives and the Red Cross are expressed only in a few tattered posters and a lapel button or two. And all the other work that might have been recorded more thoroughly lies in a half forgotten file of lists and newspapers that are of interest only to the few.

How valuable a picture history of those days would be now—but no more so than the story of today twenty or a hundred years from now. And the amateur is in the perfect position to make that history today. For instance, was the draft photographed in your town and is there a picture of the ambulance you contributed? The New York newspapers admit that they have no really complete record in pictures of some of those important events, and say it is because they did not think soon enough of sending out their photographers with the assignment of covering the draft completely from every angle. There are a few pictures of some parts of it, but there is no real picture history and now it is too late to make one.

So many things are happening so fast that it is difficult to realize that this event will be important later, and that it merits the expenditure of film and paper necessary to its recording—the facts are much easier to recognize after the event. The photographer who starts now to make a record of local history will be wise to make certain that he misses nothing of importance by shooting even the smaller events and getting shots of the people who may do even little things that contribute to the war effort. He will photograph meetings and speakers and parades and anything else that happens and he will make complete records as he goes along. Names and dates are vastly important and need to be written on the back of the prints or securely attached to them. We recognize their faces now, but who will be able to do so fifty years hence? Buildings and farm projects—all the ordinary events of the coming months may be important to some historian later and may have real national value even though you may feel a bit silly when you photograph some of them.

A carefully documented file of pictures—the best pictures you can make—of the everyday events for the duration may become a most valuable record and one you will be proud to have made. So keep up your photography and turn it to account wherever you can. You will find those in authority cooperative and as anxious to have such a record as you are, provided you use discretion in choosing your subjects and consult them before photographing factories and other objects that may be on the forbidden list. Keep the camera at work and let it help you to do your part.



"VALENTINE". BY GUSTAV ANDERSON, AMITYVILLE, NEW YORK. THOUGHTFUL USE OF SIMPLE MATERIAL MAKES AN INTERESTING PICTURE. MADE AT 1/25TH OF A SECOND AT F/11 ON PANATOMIC X FILM WITH MEDIUM YELLOW FILTER

The Simple Camera

A letter from Gambier, Ohio, raises a question that is of real interest to the owners of any camera, but particularly to those who have box cameras or folding affairs with few adjustments. It says: "I have a cheap folding camera with two shutter adjustments and three lens openings. It has no focusing scale and no other gadgets but makes excellent pictures. What special knowledge is required to use such equipment for pictures that are out of the ordinary and what can you tell me that will improve my work?"

Such inexpensive cameras are splendid for the types of subjects for which they are designed, and in their fields they are as successful as any of the more complicated and expensive cameras. Their limitations arise from the comparatively slow shutter speed that is made necessary by the small lens apertures, which are again caused by the cost of producing larger lenses. The result is that such lens and shutter equipment requires still or slow-moving subjects in average light. In poor illumination the negatives are likely to be underexposed because the diaphragm opening cannot admit much light, and the fact that the shutter is usually set at $\frac{1}{25}$th or $\frac{1}{30}$th of a second means that moving subjects will be blurred in the print.

But these cameras were planned by their makers to be used by people who were not sufficiently interested in photography to want to spend much money on equipment or to do any great amount of studying. The lens and shutters were arranged to give the best possible pictures under average conditions and when used for those shots they do just that. No extra gadgets were included to be wrongly adjusted. The important thing for their users to remember is that they cannot work at short range—usually not less than seven or eight feet—that the subject must not move unless it is fairly far away, that the light must be that of the average day, and that the camera be held absolutely still while the shutter is operated. Within those limits the simple camera is capable of far more than most photographers can do—even the least complicated camera is a "better man" than most of its owners.

As to making outstanding pictures, that is not so easy with the box camera, or any other. It requires first an idea of what a really unusual picture must be, and then a feeling for the best lighting and the perfect

timing that catches every element in the composition just where it belongs in relation to the other elements and with respect to the composition as a whole. Choosing the subject matter is vital, and no skillful technique can make the ordinary subject exciting. That brings up the point of imagination, the factor that does most for the photographer. There are no directions for the increasing of this faculty unless seeing picture exhibitions, and studying pictures in magazines and newspapers, can be used to increase the supply of ideas. And those suggestions will not help much unless the photographer does a lot of practising.

Try this: decide which picture in some current magazine appeals most to you and then plan something that will express the same thought. Place the picture elements so that there is a side-lighting and try several shots from different angles and varying distances to see which will be best. Then print and show the one that comes closest to the effect you wanted. And keep on shooting—no good photographer ever arrived at that point without making a great many pictures.

The Problem Corner

Miss E. L., Dayton, Ohio, asks: "How can I determine exposures and what is the preferable method to use in making pictures indoors by the light coming through a window?"

ANS.—Window lighting is most effective for informal portraits that include more of the setting than is generally used in portraits of more formal type. The lighting seems entirely natural in the prints provided the dark side of the face is not too dark, and this requires either a supplementary light or a reflector inside the room. Increasing the exposure for shadow detail will not work, since the difference between the two sides of the face is too great to be recorded properly on either the film or the paper.

Paste tinfoil roughly on a fairly large card and have someone hold it so that the light is reflected into the shadows while the camera is wherever you please. Do not use a white towel for a reflector. The matt white will light up the shadows but it will not give the tiny highlights that add the feeling of texture to the face.

An alternate plan is to use artificial light in the room. It should be so placed as not to throw any opposing shadows and its only purpose is to light the dark areas. If the daylight and the artificial light seem to be about equal in intensity, they will probably balance about right since the film is less sensitive to the artificial. The exposure should usually be based on the brightness of the shadows if the usual portrait effect is desired. Try shooting against the light for some shots, but watch against having the sun shine directly into the lens.

This and That

Wiping the camera or enlarger lens with the end of your necktie, or whatever bit of cloth comes most conveniently to hand, is a fine way to ruin the definition of the lens. Tiny scratches are made each time and eventually they spoil the perfect surface and from that time all the pictures are a little less sharp than they should be. Carrying lens tissue with you is a good plan, and the new Ross Optical Tissue in its handy pocket package is the convenient way to do it. The tissue seems hard, but I have used it for some time and recommend it highly.

For owners of movie projectors, Castle Films has brought out a number of new films ranging from the thrilling News Parade and 1941 Football Thrills to animated cartoons in black and white or color. Some of the films have sound for projectors that can use the sound track. For full details and the large catalog address Castle Films, 30 Rockefeller Plaza, N. Y., and mention Camera Trails.

If the bellows of your camera has tiny leaks that spoil your negatives with little streaks of light try Lightseal, a new black liquid that seals them up permanently. It dries rapidly and can be used for emergency repairs in the field without tools or heat. It may be obtained from Willoughby's, Inc., 110 West 32nd Street, New York, at 40 cents per half-ounce bottle. You might ask for their bargain catalog when you write for it. Mention Camera Trails, please.

The Universal Photo Almanac for 1942 is a valuable addition to your photographic library. It has sixteen articles on a wide range of subjects, a pictorial section and a helpful formulary in its 270 pages. It may be obtained from the Falk Publishing Company, 10 West 33rd Street, at $1.

Every photographer who wants to do color prints—and who does not?—will want to investigate the Iso-Color Process that permits making of finished prints in forty minutes. Full information may be obtained from Spectrum Products Company at 33 West 60th Street, New York. It is a simple process requiring only nine steps.

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For an inexpensive yet well-made enlarger check on the Federal line distributed by Ray-Gram Corporation, 425 Fourth Avenue, New York City, who will send a catalog to readers of this department.

Do not forget the importance of side-lighting in all black and white shots. Keep the sun over your shoulder for color work if you want a feeling of depth.

Camera Trails is conducted for the benefit of Nature photographers and maintains a service for their help. Questions will be answered in The Problem Corner or by mail, and your editor welcomes both questions and any suggestions you may care to make. Address your communications to Norris W. Harkness, Nature Magazine, 1214 Sixteenth Street, N.W., Washington, D. C.

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LICHEN LORE FROM THE PHARAOHS

By G. G. Nearing

Used by the ancient Egyptians, who treasured it sufficiently to deposit baskets of it in the tombs of their Pharaohs, a lichen, *Evernia prunastri,* which clings to the bark of forest trees in the northern hemisphere, is now known to contain an essential oil prized for perfumery. Under the name oakmoss (Mousse de chene), this plant is distilled for its fragrant essence, which thus travels from forest to boudoir unsuspected by most of us. The secret of its use was rediscovered only a comparatively few years ago. Not until the supply from Europe was cut off, and manufacturers began looking for local sources, did it become general knowledge that this lichen had been shipped in, many tons at a time, to fill the growing demand for its fragrance.

In our own mountain forests, where it could easily be gathered from felled tops and branches around lumbering operations, oakmoss is found in a form slightly different from the European, though no less useful. Some botanists call it *Evernia thamnodes* or *E. mesomorpha.* The near relatives *Evernia furfuracea* and *E. ceratea,* fairly common at high elevations, contain the same oils. Even the humble reindeer moss, really another lichen, *Cladonia rangiferina,* yields a similar substance which, though not in itself fragrant, has the same valuable property of fixing other scents.

So once again modern technology has borrowed a secret from the ancients, but kept it so nearly unknown that most naturalists will be surprised on reading these words.

OWL INTRUDER

By Alice Staib

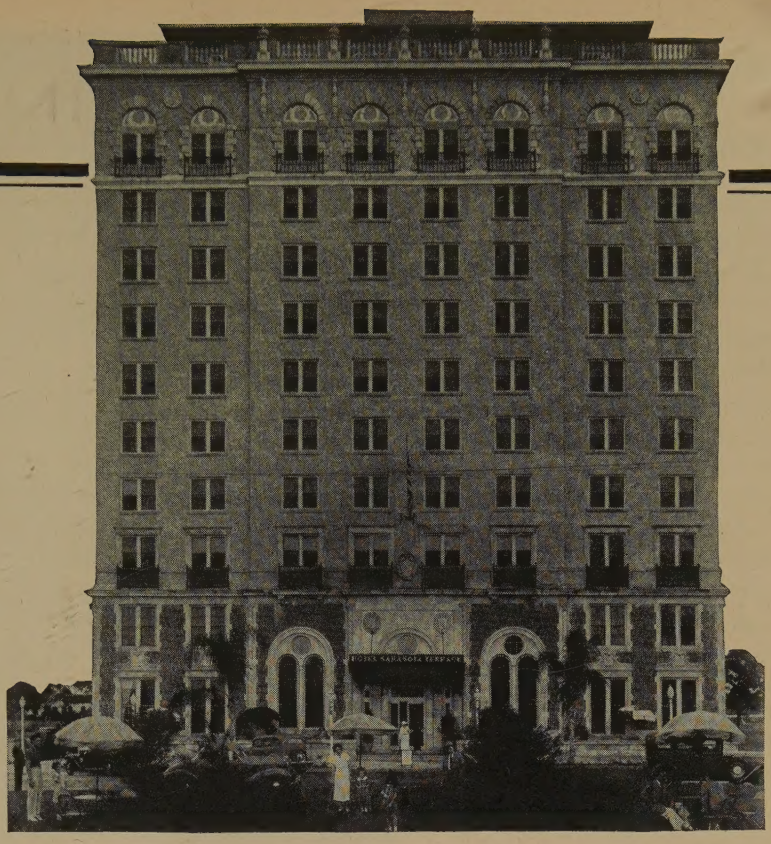
From my third floor room in an old mansion house where I lived, one looked out into a rambling back yard that ended in a ravine, a perfect rendezvous for birds.

One early November day a screech owl took over a hole in a tulip tree that grew close to two of my south windows. Then, one morning, I heard an unusual noise in a wild cherry tree on the edge of the ravine. Watching, carefully, I saw a robin, a thrush and a cat bird, each taking turns flying with outspread wings, through a clump of leaves on the tree. There the owl was trying to hide. They kept flying, noisily, back and forth for some time, then flew away only to return in a short time with another robin, a cardinal and a wren. All except the cardinal took up the maneuver. The red bird perched on the top of the tree and sang, lustily, as though in encouragement.

The little wren took her turn with the larger birds, really making a lot of noise for her size, but the owl neither moved nor made a sound. The birds finally gave up the matter and flew away. Quiet reigned once more in the old wild cherry tree.

A few days later the owl robbed a thrush nest and was promptly chased to its tree hole by a robin and the thrush, making the noise that only an excited thrush and robin can make.

I never saw him again. I doubt that he died of fright in the tulip tree, and suspect that he lived up to the vaunted wisdom of the owl and left while the leaving was good.



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Nature in Print

By HOWARD ZAHNISER

THE skies these days and nights are scenes of more momentous events to human beings perhaps than those that Raymond S. Deck describes and signifies in his recent bird book *Pageant in the Sky.* Rachel L. Carson's *Under the Sea Wind: A Naturalist's Picture of Ocean Life* may seem of trivial importance when timeliness makes human interest in the high seas a concern largely with naval engagements. The strategic importance of the Gulf of California may encroach on the present pertinence of John Steinbeck's and E. F. Ricketts' *Sea of Cortez: A Leisurely Journal of Travel and Research.* In fact, of all the books I now have at hand apparently the only one appropriate to the perplexities of the moment is George C. Vaillant's *Aztecs of Mexico: Origin, Rise and Fall of the Aztec Nation.**

So it may seem—or rather has seemed since in the midst of preparations for a discussion of these recent books I, with the rest of my countrymen, was startled into expulsive concerns with the immediacy of war and the requirements of national defense.

At that moment it had seemed that George C. Vaillant's few paragraphs on the wildlife uses of the Aztecs were of most importance to me. It had seemed interesting to know that "the turkey was their chief domesticated fowl;" that "there is some evidence that they bred geese, ducks and quail also;" that "the seasonal migrations of the birds . . . offered a profusion of geese, ducks and other wild fowl;" and that "hunting, when possible, produced food, but as early as Upper Middle Culture times the deer were nearly all killed off."

News from far-away Pearl Habor in Hawaii seemed to change all those interests for the time being. Other comments by George C. Vaillant came to mind: "Aztecs nurtured within themselves the seeds of their own destruction." . . . "There are times when the national will seems to disintegrate before intangible factors individually insignificant." . . . "The emotional condition of the people was peculiarly receptive to the rumors." . . . "A final factor dooming the Aztecs to inevitable defeat was the political structure of Indian Mexico, which provided no way of converting military success to the establishment of a powerfully consolidated state." The lessons that might be learned from the tragic conquest of a colorful civilization by a European invader more than 400 years ago had suddenly come to seem more important than the description of that civilization or the demonstration that "Aztec civilization died, but the Aztecs still live" and still make their contributions to our life.

A week later the implications of this excellent volume on archaeology still seem important, still timely, but once again the abiding significance of knowledge about the natural world in which we live comes back to mind, returns also with the assurance that this knowledge is never without an influence for strength, serenity, and fortitude. The stresses and the strainings of a war seem, on reflection, only to heighten the importance of devoting a part of one's interest to the abiding realities of living—not only for the long-time values of such an interest but also for its contributions to strength in the major concern of the time—strength both individual and national.

"The things of our minds have for us a greater toughness than external reality," says John Steinbeck in one of his philosophical comments on experiences described in his portion of *Sea of Cortez.* This speculation seems pertinent now to other incidents too, and perhaps especially thoughtworthy at a time when there need be no doubt about our concerns with external reality. "Thoughtworthy" is indeed a good appellation for all of Steinbeck's journalized report of the collecting trip that he made, ostensibly for marine specimens, with Edward F. Ricketts, Director of the Pacific Biological Laboratories. They made the collections all right, as evidenced by the annotated catalog of species encountered and the illustrations in both color and black-and-white that are included in *Sea of Cortez,* together with maps, bibliography, and other contributions that undoubtedly, as the book says, comprise "materials for a source book on the marine invertebrates of the Panamic Faunal Province." Yet the expedition returned with more than specimens and other material for scientists—so much more, in fact, that future expeditions may well consider their personnel incomplete without some such imaginative writer as John Steinbeck.

"This little trip of ours," says Steinbeck in a paragraph that characterizes as well the resulting book and also provides a sample of his own writing in it, "was becoming a thing and a dual thing, with collecting and eating and sleeping merging with the thinking-speculating activity. Quality of sunlight, blueness and smoothness of water, boat engines and ourselves were part of a larger whole and we could begin to feel its nature but not its size."

So also does Steinbeck's reader begin to feel the nature of a larger whole. Likewise the reader of Rachel L. Carson's *Under the Sea Wind* experiences, and with a keener sense of immediacy, a feeling for the nature of this great whole of which we ourselves are a part and, beyond this, something approaching a comprehension of the struggle that is living. Our own battles for existence, and our own trying losses in the numerous (Continued on page 104)

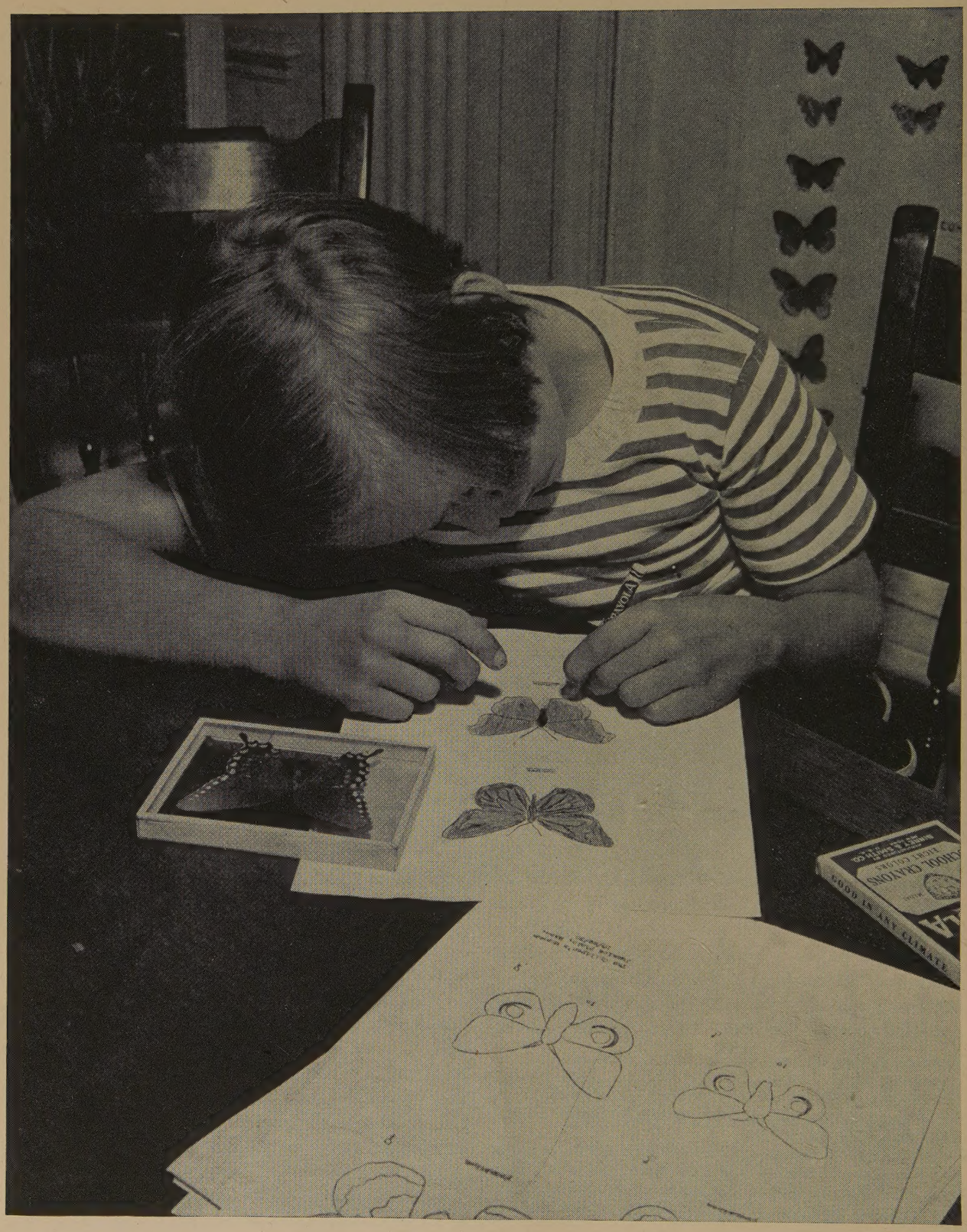
*Recently published books discussed in this article are:

Aztecs of Mexico: Origin, Rise and Fall of the Aztec Nation. By George C. Vaillant. Garden City, N. Y.: Doubleday, Doran & Co., Inc. 1941. 340 pp., with photographs, drawings, bibliography, and index. $4.

Sea of Cortez: A Leisurely Journal of Travel and Research. By John Steinbeck and Edward F. Ricketts. New York: The Viking Press. 1941. 598 pp., with 15 illustrations in color, photographs, drawings, catalog of specimens, bibliography, glossary, and index. $5.

Under the Sea Wind: A Naturalist's Picture of Ocean Life. By Rachel L. Carson. New York: Simon and Schuster. 1941. 314 pp., with illustrated glossary and 8 illustrations by Howard Frech. $3.

Pageant in the Sky: A Book of the Modern Sport of Bird-Watching. By Raymond S. Deck. New York: Dodd, Mead & Co. 1941. 268 pp., with numerous photographs by the author and an index. $3.



A STUDY IN CONCENTRATION

Barbara is learning her butterflies at the Children's Museum by coloring outlines with a case containing a specimen before her. She will know the flitting beauty the next time she sees it outdoors. Photograph by Hansel Mieth

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THE WOOD TORTOISE FINDS AN INTERESTED FRIEND IN THE CHILDREN'S MUSEUM

In the live museum are living animals instead of the stuffed specimens of old-style museums. Photograph by Hansel Mieth

Let your child visit one of the children's museums; it will be—

Exploring a New World

By JOHN RIPLEY FORBES

THE snake struggled, trying to escape from the hands of its young captors. The children paid little attention to an increasing audience of down-town Bostonians for they were busy trying to get the snake back in a box. Women gasped with horror as the little girl, a sweet child in rather worn dress, fearlessly assisted her brother. The task accomplished, the youngsters went on their way, their only reply to many questions being that the snake was being taken to the Children's Museum.

Many think of a museum as a place with a dingy, dead, hushed atmosphere and shelves and shelves of crowded specimens—a sort of animal morgue. But museums have changed. The old "find your own way about" attitude is gone. Stodgy old curators no longer lock themselves up in dingy offices while the bewildered and often bored visitors move about the exhibit halls.

Some thirty years ago a far-sighted woman with a love for children set up a museum. It was only one room and

YOUNGSTERS FROM THE MUSEUM EXPLORE THE WORLD OUTDOORS

Through the field trips of the various clubs maintained by the Children's Museum the members learn to know Nature on the spot. Here the mineral club is gathering specimens and studying rocks, some of which will be added to the museum. Photograph by Robert J. Keller

a few cases of specimens in an old house in Brooklyn, New York. Sceptics criticised, but in less than a year Miss Anna Billings Gallup made it a huge success. Thousands visited her little museum, which soon became one of the outstanding activities in Brooklyn. For years, under her able direction, the Brooklyn Children's Museum was known and recognized as the most outstanding of its kind in the world. The museum field awakened. Large and small museums applied her ideas.

Today there are twenty-one children's museums in this country carrying on thrilling and exciting programs. Among these the Boston museum is the most outstanding example. Most wide-awake museums, large and small, have organized children's departments. Today most museums are vital, modern assets, serving the public realistically.

But let us get back to our two youngsters and their burden. They could not afford two trolley fares—and snakes are not popular passengers—to carry them to the museum in suburban Jamaica Plain. Sturdy and determined legs finally brought the children to a lovely large home near Jamaica Pond. It was an up-to-date mansion, and was supplemented by a second with an attractive little auditorium for some 500 children. At the information desk, just inside the door, the children asked to see the man in charge of the live museum. Yes, live museum—for this museum is not solely a place for dead things.

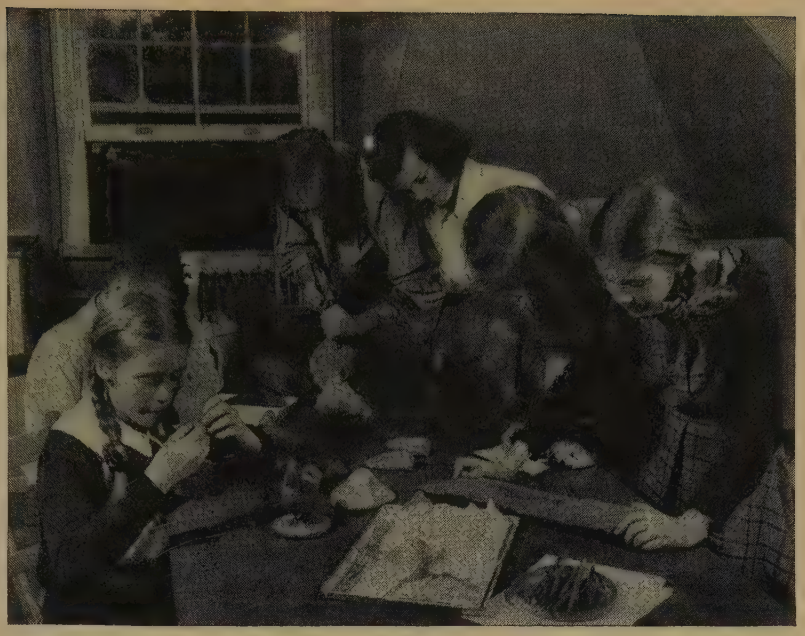
The children were directed to a pleasing room painted a warm green. Large windows admitted plenty of sunshine and fresh air. Around it many kinds of wild life lived happily in large roomy cages. The songs of birds filled the air, a mouse ran about a little wheel, its tiny feet kicking up a steady pat pat as though competing with the birds. A gray squirrel added its chatter to the happy din.

A young man greeted the children, was introduced to the snake, and put it in a large cage with several more of the same species. As reward for this new addition the young collectors were taken behind the scenes where special exhibits were being made. This provided a thrill that more than made up for the long journey.

One of the earliest child enthusiasms is love for living creatures. So the moment children enter the museum they start the thrilling adventure of exploring a new world. There is no need for an expensive ship to sail to the frozen North, or elaborate safari for darkest Africa. By providing a world of their own—a world of Nature—the children's museum turns every child into an explorer.

THE MAIN MUSEUM BUILDING

Through these doors more than 200,000 children pass each year to broaden their horizons and knowledge. Some 60,000 join in the club activities at the Jamaica Plain museum. Photograph by Hansel Mieth



THE MINERAL CLUB AT WORK
Here they are concentrating on a project that involves the making of models and identification of specimens gathered in the field. Photograph by Hansel Mieth

Within and without its walls they know new life thrills and surprises.

In the live museum were interesting animals—porcupine, skunk, squirrel, guinea pigs, rabbits, mice, frogs, alligators, tropical fishes, snakes and others. There was learned Nature lore and, by intimate association, sympathy for and understanding of animal friends.

In the bird room many attractive exhibits were arranged in such manner that the smallest children could easily look at the bright-colored birds. The labels were in simple but vivid language. They told a story and were boldly hand-lettered and placed low enough to be easily read.

One exhibit told about the various common birds and showed something of their values besides song and beauty. Woodpeckers do not make holes in trees to destroy—the message read—but rather to save, and to rid the trees of borers. The exhibit showed that the bird family is important in the constant battle against insects. The story of this display is aided by attractive illustrations, built around the idea of a house. A crow dressed and equipped as a garbage collector shows the child that this bird is a great carrion feeder. A swallow with a broom cleans the cobwebs from the ceiling, illustrating the fact that it feeds upon insects found in the sky.

Another exhibit answered questions about birds of prey, showing that most hawks and owls are helpful to man's interests, destroying many destructive rodents. Thus is carried a message inspiring respect for these magnificent birds, rather than desire to slaughter them. Great surprise registers on many a young face when they learn the duck hawk, central figure in the exhibit, can fly 180 miles per hour.

Some children lie on the floor talking out loud, not whispering, with no military-looking, unsympathetic museum watchdog to shush them to silence. Instead curators or attendants are eager to answer all questions; to inform and entertain the young visitor. After all, how could a children's museum be dormant with questioning boys and girls to awaken it?

There was nothing dormant about the children in the bird room. Some tots were busy coloring outline pictures of birds. Most small children enjoy coloring and the process paints a clear and vivid picture of the bird in the mind. Seen outside the museum, it will be recognized as an old friend. One of the older children was poring over a mimeographed paper telling about birds. Blank places here and there were to be filled in, and the boy was looking about the room trying to track down the correct answer for one of those blank spots.

BACK FROM A FIELD TRIP
Material for the laboratory and for exhibits has been gathered on a summer expedition, and notes are being written up. Photograph by Robert J. Keller

Such scenes represent a long step from museums of the past. Here children are working, being educated, and having a wonderful time doing it. In school the child is required to go to class; follow certain studies; fit into a routine. In the world of the children's museum no one makes him go; no one makes him play the museum games, join a club or attend a lecture. They do these because they want to, they enjoy it; it's fun.

Parents sometimes become curious

ENTHRALLED BY MOTHER COTTON-TAIL AND HER YOUNG
This exhibit is specially popular with the younger visitors to the children's Museum. This is a habitat group but there are other live exhibits. Photograph by Robert J. Keller

about this wonder house where their children go. Finally they get up enough curiosity to let the youngster take them visiting some Sunday afternoon. With obvious pride the child introduces his parents to the museum staff. Thus a closer contact is made between the home and museum, which is as it should be.

Within the entire building was a home-like feeling so essential to a children's museum. It was not just another institution for there was a feeling all through the house of its "having been lived in"—a feeling that lingers and charms and holds the visitor in an atmosphere that is both welcoming and unofficial.

The background of the museum is Nature study, although it covers a wide range of subjects including folk lore, history, industrial science and such. But what child is not curious to explore the great and unlimited world of Nature? So such a background is natural.

In the entrance hall are exhibit cases, which, I learned, were changed almost every month. In fact, changing exhibits is a feature of the program. They are closely correlated with the school program, the seasons and the course of current events. There is something new each month and the children eagerly look forward to it.

In the animal hall a little tow-head was talking to a group of adults. About the lad's arm was a green band, the mark of a junior guide. The children even take over the lecturing, with no complaints. In fact, most adults are amazed at the knowledge and entertaining presentation of these youthful guides. The displays in the animal hall ranged in size from exhibits of the elephant to baby cotton-tail rabbits, and included such exotic and strange animals as the duck-billed platypus and mongoose.

In the geology and mineralogy room earth wonders are presented in attractive display. Beautiful murals on the walls tell the story of the history and formation of the Boston Basin. Many common minerals are arranged to illustrate how man makes use of them; their commercial values are vividly portrayed.

Through fossil specimens and fragments of bone the exciting past is pictured. This room was designed by a geologist from the Massachusetts Institute of Technology, an expert in his field and one who loved and understood children. The exhibit is, therefore, something within the child's comprehension and tells a story that thrills and interests the young visitor. Millions of years go by in a few ticks of the watch, and the child has hit a new high in his exploring of a new world.

Another room reveals the mystery of the sea; another the secrets of insects. The list of fascinating exhibits is endless.

In the reception hall, there was much activity about what the children called the game table. They were playing the popular treasure hunt. On the game table was a gaily-colored treasure chest. Each player was given a pencil, a game board on which to write, a sheet of paper and a printed question to start the hunt. The first question read, "I live in the ground and have a hinge on the door of my house. Can you find me?" Another, "I am attractive to look upon, not at all fierce, but all animals fear me when I raise my tail. Who am I?"

After reading the first question given them the players looked about the museum to find what would fit the description—a trap-door spider, answered the first, while the skunk took care of the second. Once the answer is found, the child looks on the proper exhibit case to find a typed question that perhaps reads, "When I run from you, I wave a white flag. Do you know me?" And so it goes. At the end of the treasure (Continued on page 106)

If you were a bird seeking safety, or luring a mate, you would find that—

Color Counts

Photographs by the Author

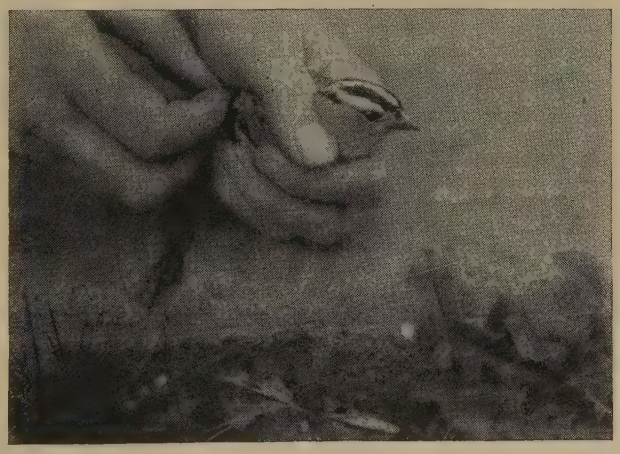
By F. L. R. ROBERTS

COLOR plays an important part in the life of a bird. It means protection in many cases and circumstances. It brings together avian wooer and wooed. It has other values, some not entirely understood. But there is no doubt that color counts.

To Abbott H. Thayer, ornithologist and artist, goes credit for some important discoveries about protective coloration. Naturalists had long marveled that even brightly-colored birds were often difficult to see in their own habitat. The man who saw with both the eyes of an artist and bird student explained this. He gave to ornithologists the phrases "obliterative shading" and "counter-shading."

If you will recall your school class in drawing you will remember that to give an effect of roundness to a flat surface drawing of an object, such as a ball, the lower part of the picture is shaded. When light comes from above, shading the lower surface gives an impression of solidity, or depth. If shading could make a flat surface seem to have depth, Mr. Thayer reasoned, counter-shading might make an object lose its appearance of solidity. Experiments proved him right.

The artist modeled a bird and covered it with gray flannel. He placed this against a background of the same flannel, with light coming from the sky. Even though the model was exactly the same color as the background, it could be seen from a distance without difficulty. He then began at the midline of the side and painted the model darker and darker as he went up, so the upper surface was considerably darker than the original flannel. This was to counteract the effect of the light from above. Then he painted the under surface a much lighter hue, beginning at the midline of the side, as before, and working downward. Again he placed the model in front of the gray background. This time, although it was very different in color, it was invisible at a distance of a few feet.



THE GAMBEL'S SPARROW
The markings on the head are immensely valuable for concealment of this bird

At the meeting of the American Ornithologists' Union where Mr. Thayer first described his discovery, a blanket was placed near the front of a platform. A wire was strung between two chairs, in front of the blanket. Threaded on this wire were some potatoes, lighted from above. When asked how many potatoes were on the wire, his audience said three. He reached to where apparently nothing was on the wire, gave a turn with his hand, and there was another potato that had been invisible. These potatoes were all counter-shaded, and he could make them appear or disappear by turning them so their lighter or darker surfaces were uppermost.

Almost all birds are counter-shaded, according to this principle, and it is the chief method of gaining invisibility. The spotted sandpiper and many other birds have even the bill counter-shaded.

Counter-shading is not, however, the whole story. While working with his model, Mr. Thayer placed it before a piece of cloth on which were painted short black lines of various lengths and widths, in indiscriminate positions. The unmarked model, even when counter-shaded, showed up plainly against this variegated background. A model marked like the background but not obliteratively shaded was also conspicuous. Then he counter-shaded his patterned model and it was invisible against the patterned background. As birds are usually viewed against a variegated background, they must have both counter-shading and mimicry if they are to be difficult to see.

Most ground-dwelling birds that haunt swamps and meadows have a striped pattern somewhat like the colors and patterns of reeds and grasses. The American bittern often stands with his body erect and his bill pointing to the sky. In this position his stripes run up and down and he is less conspicuous than when pointing his bill ahead.

Owls are usually seen against a background of branches. The shadows of branches also form strong patterns of dark lines. The cross-barring of the owls forms similar patterns and helps to make these birds merge with their background. Young owls in hollow trees need no protective coloration, and do not have the familiar cross-barring and counter-shading of the adults.

The orange and red epaulets on the shoulders of the

FIND THE BIRD ON THE NEST

It is an adult spotted sandpiper whose brownish back, light ruptive streak over the eye, and dark line through the eye, make it difficult to see it on its nest in the weeds

redwing blackbird probably serve to make him conspicuous to a companion flying a few feet above his singing station. But they may disguise him to a hawk flying high overhead and viewing him against a marsh background, since many of the marsh plants and flowers are yellow or red. And his mate, even more useful to the species, is streaked like a sparrow, and matches her grassy habitat.

Even the brilliant blue of the bluejay probably has some protective value. Seen through branches, he may be mistaken for a bit of sky. In the winter, when he is usually viewed against sky or snow, his color is doubly protective, for when the sky is clear most shadows on the snow are skyblue. Note this the next time you see a bluejay.

HERE IS THE HARRIS SPARROW

Visible here, a few feet away it camouflages its shape so that it does not look in the least like a bird and proves that color counts

In addition to counter-shading and mimetic coloring, which help them to lose the appearance of solidity and to fade into the background, some birds also have streaks or patches called "ruptive" or "secant" designs. These "break up" the bird, so that instead of appearing as one bird-shaped object it seems to be several unbirdlike objects.

Mrs. Roberts and I used to band fairly large numbers of spotted sandpipers every summer. The young are likely to leave the nest soon after their down is dry and are then difficult to catch, so we tried to band them soon after hatching. One evening we found the four eggs in a certain nest just pipped. Early the next morning we returned, hoping to band the young before they left, but the nest was already empty. Since the young must have hatched very recently, it was probable they were within a few feet. We stood still and studied every inch of the ground around us. We moved forward about a foot at a time, paying particular attention to where we put our feet.

At last we located three of the young, but the fourth eluded us. Standing within about a yard of the nest, we spent at least fifteen minutes examining the ground about us. Finally we discovered the youngster right against the toe of Mrs. Roberts' boot! It was practically indistinguishable from its background of pebbles and sand, sparsely littered with fragments of dead weeds and grass.

This bird mimicked its surroundings as to color, being gray-brown flecked with dusky. It was also obliteratively shaded. But not the least effective part of its coloration was a black streak from its bill to its funny little fuzz of a tail. This streak and the deeper color formed by the constriction of its neck seemed to divide it into four objects not shaped at all like birds. This black ruptive streak is seen in the young of many birds, such as the killdeer, and black streaks and patches serve as ruptive designs in many adult birds.

The eye of a bird is a bright spot that would often be conspicuous. In many birds, such as the Maryland yellow-throat and the shrikes, it has been masked by a black spot surrounding it, or a black line through it. On first thought

FIVE LITTLE SHRIKES IN A ROW

These are young migrant shrikes. They have bright black eyes but the heavy black line that runs through the eyes serves as a striking mask

A YOUNG SPOTTED SANDPIPER
Note the black streak through the eye. This helps to conceal the shape of the head and make the eye less conspicuous. Note the counter shading of the bill

these black patches and streaks seem to make the bird conspicuous. But the next time you see one, notice how these marks conceal the bright eyes and also camouflage the bird by dividing it into unbirdlike parts.

Other marks that seem too conspicuous often have important uses. For example, a white rump, which is a common mark among birds, may be a life saver. Being conspicuous, it must often serve as a target to induce the enemy to strike too far back. Thus the presence or absence of the white patch may mean life or death.

Lengthwise barring, which makes a bird conspicuous among the grasses and rushes, has a protective value few people realize. When any animal with lengthwise, horizontal striping moves along the ground, it is difficult to judge its speed except by watching the head or tail. Anyone who has struck at a moving snake is aware of this fact. An enemy, such as a preying hawk overhead, may aim at the body of the moving bird but find his quarry gone by the time he strikes. And so the stripes of the bittern, which merge with the tall rushes when it stands erect and still, also help to protect the bird when it moves forward, for then it lowers its body and the stripes are lengthwise and horizontal.

CLOSER VIEW OF THE HARRIS SPARROW
In this pose the black face is very noticeable and gives an excellent indication of how useful it is for concealment at a distance

When lengthwise barring of the body is combined with cross-barring of the tail, as it is in some species, motion is most conspicuous in the tail. This may influence a hawk or other enemy to strike too far back and capture only tail feathers, or perhaps miss altogether. Such marks would not protect the bird under all conditions; but if they serve for a few brief seconds once during the life of an individual, they may make it possible for him to pass his characteristics on to posterity. Thus they may be an important factor in evolution.

Juvenile birds are often better examples of protective coloration than are adults. Young robins show the protectively spotted breast that is the badge of the thrush family, to which they belong. Adult gulls, terns and avocets depend for safety more upon their wings than upon their coloring; but their young must trust to concealment rather than to early flight, and all are protectively colored. There are examples, however, of protective coloration, or the lack of it, which scientists have not yet been able to explain. For instance, most young hawks and owls need no protective coloring and are white. But why are young ospreys protectively colored?

Young rails and coots, or mudhens, offer an interesting comparison. Both birds haunt marshes; but rails prefer reedy marshes where high rushes line the shore, while coots choose places where lower grasses and semi-aquatic plants are at the shore line. Here there are often low marsh flowers, which are usually orange, shading to darker or redder centers. Adult coots are gray birds, and it is with a start of surprise we first discover their downy young are black with red on top of their heads. The red is so bright no flatterer would call it "auburn." It is flaming scarlet, bordered with bright orange. At first one might think these babies would be conspicuous with their bright heads and inky-black bodies; but he will realize they are most elusive when he

KILLDEER NEST FROM ABOVE
There are two eggs and two newly-hatched young but their markings and the typical nest site make it difficult to see what is what

NEWLY-HATCHED VIRGINIA RAILS
They show up clearly against white but just try to see them against black mud. Note the long toes that enable them to patter around without becoming mired

spends several hours searching in a clump of marsh flowers—where he is sure several are hidden—and fails to find a single one.

Unlike the young coots, the little rails have no gaudy crowns. Such coloring would be noticeable among the tall reeds where they spend most of their time. But against the black mud of their home, with dark shadows all about, their little inky-black bodies are almost invisible.

It seems reasonable to suppose that in a poorly-lighted nest the babies with brightly-colored mouths would receive more food than others. This factor seems to have been of sufficient importance to have selective value, for the mouths of many nestlings, or the edges of their mouths, are brightly-colored. The young double-crested cormorants, for example, have mouths lined with lavender. In all cases, the color fades soon after the birds leave the nest.

For one reason or another, many birds need not depend upon concealing coloration, but are free to wear gay plumage. The oriole, with its nest far out on a swinging elm twig, has less need to hide than has the female bobolink, whose nest is on the ground in the meadow. The male bobolink, free from the duties of incubation, has evolved a gay livery that is useful when he wants to entice intruders away from the nest. So his coloring, if it does not protect him, does protect the young and help to preserve the species and pass on the characteristic.

Are birds' habits the result of their colors, or are colors the result of habits? We can not be sure; perhaps it has worked both ways. Perhaps baby coots have always had their flower-like crowns. In that case, if a nest was among tall reeds, or on a meadow, the young would be so easily spied by enemies that few would grow up to reproduce and pass on the characteristic of building nests in these places. But those born among the marsh flowers would survive, and their descendants would tend to nest in similar places. Thus the coloring of the bird would have determined its habits.

But suppose the young were not always colored to simulate a flower. If the birds nested in marshes, the young that happened to be so colored, or tended to be so colored, would more easily escape their enemies. They would live to reproduce and pass on their characteristic coloring, while other nestlings without this protective coloration would not survive. In this case, habits would have determined the coloration.

It seems probable that coloration has influenced habit in some cases and habit has influenced coloration in others. Both color and habit probably have mutually influenced each other, even in the same species, each being to some extent the cause and to some extent the effect.

Nor must we lose sight of the fact there are probably other factors of which we are now ignorant. It may be that ultra-violet rays, or some other agency not yet explained, have decided influence on birds' plumage. Also many birds lack color characteristics that would seem most useful, or possess some that would seem detrimental. For instance, if a black spot or streak about the eye is a useful characteristic, why is it absent in so many birds?

Some physiologists who have investigated the eyes of birds think it possible they do not see color as such, that they appreciate only tone, pattern, and degree of light. However, even if this theory should be true, we must still admit the influence of color; for different colors have different tones and degrees of light. And there is no doubt that many enemies, including man, are influenced by color.

Of course it is difficult for us to understand conditions that prevailed in prehistoric times, and we are prone to try to explain everything in terms of the present. Evolution is a very slow process; and it may be that some of the characteristics, for which we find no adequate explanation now, may have been of vital importance to the species in the remote past. There is much to be learned before we can understand the full significance of color in birds.

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PRUDENT PREDACITY

By H. A. BOLZ

Profound fowl the owl
To howl and prowl

At night
When opacity lends perspicacity
And capacity
To his sight.

Problems of distribution of food in times of stress turn attention to—

The Pokeweed as Food

By DORIS M. COCHRAN

THE POKEWEED PLANT

Hardy and persistent, it is truly a weed but it offers man sustenance for the taking. Photograph from the Bureau of Plant Industry

It was one of those balmy, humid summer evenings that occur so frequently in the Potomac River valley. The air was like a perfumed caress as the little breezes from the cliffs above brought us reminiscences of the honeysuckle hanging down in cascades towards the banks of the canal, successor of the one that George Washington surveyed so long ago and planned as a boat route toward the Ohio. The towpath had its day, the canal boats are moored fast to other banks, and the canal—near our nation's capital, at least—is given over to gigantic carp and catfish, which sometimes splash the water with their tails and startle nearby canoeists into believing that a whale has been disturbed.

We were not startled as we drifted lazily along in the canoe—my friend the entomologist and I—for we knew the sound well and could just discern through the twilight the dim gray body below the quiet surface of the water. The pink afterglow lit up the billowing cumulus clouds that had hung over the river valley since midafternoon. They might bring rainfall during the night, but not right away. For this we were grateful, since we wished to prepare our campfire and cook our steak without raindrops to complicate our outdoor cookery.

As we pulled up to the bank at our chosen cooking site, my companion pointed to some leafy young plants sticking up four or five inches above the canal bank. "Those are young poke shoots," he said. "We'll have some Indian greens with our supper!" He began to break off the tender young stalks, gathering a hat full.

After our campfire was merrily blazing, he took our bucket of spring water and poured some into the pan containing the poke shoots. As soon as the greens had boiled, he threw away the cooking water, refilled the pan with fresh water, and brought the greens to a boil a second time. He again drained off the water, and the dish was done. In the meantime I had cooked our steak in a frying-pan. We melted some butter for the greens, and, seasoned with salt and the smoke from our fire, they became truly an epicurean accompaniment to our meat.

The memory of that first banquet of poke greens, eaten while the stars were pricking out in the evening sky above the Potomac Valley and the early fireflies were coming out to keep them company below, always returns each spring when I see a little basket or bundle of poke shoots for sale by some comfortable old Negro mammy smoking her pipe in the open farmers' market in the Capital City. I have either gathered or bought several messes of poke greens every spring, and I know of other people with whom they have become a habit, too. In fact, I have been the cause of setting this habit in some of my acquaintances. The delicate flavor of the greens is equal to that of asparagus tips, which it somewhat resembles. The stalk of the six-inch poke plant is far more tender and edible than the harder and tougher stem of the asparagus. The boiled poke is equally as good used in place of parsley in soups.

Last spring I became interested in using poke greens as a summer-long food. Instead of pulling up the young poke plants that every year come up as weeds in my Maryland garden, I let them stay—all three of them! From these three plants, I found I could cut a good panful of greens every week—sometimes every four days—from early March until late July. In spite of an unusually dry spring, my poke plants grew nearly an inch a day, and apparently did not suffer at all from the rigorous pruning that I gave them weekly. In August, when I finally allowed the plants to mature and set seed, the flower stalk shot up straight and tall, and in October the luscious purple berries, full of seeds, attracted the birds. I hoped that

some of the seeds would drop in my yard to sprout this spring as a beginning of my "National Defense Pokeshoot Garden". To be sure I helped them along by harvesting some of the berries and planting them where I want them to grow.

The poorest soil is good enough for the pokeberry plant. Any scraps of waste land, seeded but left without subsequent care, can produce enough poke plants to supply a delicious food to the local population. This is done without the expense of careful cultivation, harvesting and transportation that attends the enjoyment of our "luxury" crops such as asparagus, broccoli and brussels sprouts. Furthermore, these foods are in no way superior in quality to that delicious and neglected product of the wild—the hardy and tasty pokeberry.

THE AUTHOR'S POKEWEEDS
The plants that supplied greens once a week for several months, shown here ready to be harvested

This weed—for as such it has always been considered, especially in the North—grows in abundance from Maine to Florida, and from Minnesota to Mexico. Its scientific name is *Phytolacca americana.* There are many common names for the plant throughout its vast range—shoke, garget, pigeon berry, cocum, jalap, skoke, American nightshade, crowberry, cancer root, chongras, pocan bush, redweed and red-ink berry. The berries can be crushed to make a beautiful and permanent ink. Dr. Hugh M. Smith told me recently that he had come upon a letter he wrote with pokeberry ink when he was a boy first beginning to experiment with the things of Nature. He found that the ink of this letter was clear and bright nearly 60 years after its writing. The berries are also used for making wine in Mississippi and some other southern states. Some people make pies from the berries, but this is very risky, to say the least, since certain individuals are harmed by the poisonous properties of the juice. The same poisonous principle exists to a slight degree in the stem and leaves, but the practise of *boiling in two waters and discarding the water* eliminates all the disagreeable effects. If the greens "set your teeth on edge", then they have been cut too ripe or are insufficiently parboiled. The root must not be used, for it probably contains more of the poisonous element and is too bitter to be enjoyed. The young and tender tips of the stalks are edible at all times.

The pokeweed has an ancient and honorable place in the culture of early Americans, since the Indians used it as a food. Dr. Melvin R. Gilmore, in *Indian Lore and Indian Gardens,* says that "in the south, where the plant abounds, the young shoots of poke-root were cooked as 'greens' ". Around the Mediterranean region of Europe, where the pokeberry has been introduced as a food plant, it has escaped from cultivation, and sometimes turns up as a "wild" plant in a continent where it did not formerly occur.

I have searched the nursery catalogs in vain for a listing of this plant. No seedsman has seen fit to bother with it, apparently. My best suggestion, if you want some roots or seeds, is to go to some old farmer in your neighborhood. He will probably be glad to get rid of those "consarned weeds". As they can be "transplanted" by the simple process of pulling them up bodily and replanting them, without too much tender care, wherever you may want them to grow, they well merit their reputation as a weed hard to kill and impossible to get rid of. If you prefer to "eat off the country", and know of some field or river bank where these plants grow, you can take your basket and visit the same plants every week, from early March until late summer. By breaking off the older branches, new shoots will be stimulated to appear, and a harvest of the proper age and quality will be insured at all times. When allowed to grow to its full height, a pokeberry plant may attain a stature of sixteen feet in some regions.

If the transportation of green foodstuffs becomes more difficult than it is now, due to our increased need of railroads and trucks for moving national defense materials, it will be more and more imperative to find satisfactory substitutes ready for the picking at our very doors. The minimum of care and labor would be involved in "domesticating" this plant in some forgotten corner of our gardens, where its delicate flavor might delight our palates as habitually as its slender, graceful flower stalks might please our hitherto unappreciative eyes. Furthermore, we can raise more food for next winter's bird visitors.

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RAINDROPS

By MAREL BROWN

Raindrops are the tears
That fairies shed when the sun
Hides behind a cloud.

THE MALE AND FEMALE OF THE IMPERIAL MOTH

Because the whole experience of watching the life history was so inspiring, the author kept no specimens, feeling that pinned in a mount they would be poor relics of a brilliant family, so these pictures, about half natural size, are from the U. S. Bureau of Entomology

A bright yellow moth marked with orchid came, tarried a while, and, in due course, there were—

Children of the Empress

By EVA NOBLE

A LARGE moth came to our porch light one mid-August night. It was bright yellow with markings of orchid, the colors of the Imperial clan. This much we knew from our memory of *A Girl of the Limberlost,* by Gene Stratton Porter. The moth was brought into the house, placed in a woven paper basket and covered with a piece of scrim.

Within the next three days, forty-two eggs were glued to the reeds—eggs that looked like opals and pearls. Perhaps a hundred or more had been deposited outdoors before "Her Golden Imperial Majesty" had come to us. When her task was completed she became restless, seeming to demand her liberty. So we took her to the border of darkness from whence she came and set her free. Circling a few times, a gleam of gold against the tree tops, she came back to cling a moment to the window sill, then took her official departure, leaving us holding the basket with her potential offspring in it.

A week later, we left Jacksonville for an annual trip to the Great Smoky Mountains. The waste basket had to go along for the eggs were glued to it and could not be removed without disaster. With it half-concealed in a hat box, we set forth, keeping the contents under observation. By the time we reached Atlanta, strange befezzed caterpillars were going in and out of the reeds, and peeping over the rim of the box. The count at Gatlinburg, Tennessee, in the Smokies, was forty-two.

Food was a serious problem, and leaves of many kinds of trees and shrubs found along the highways were declined by violent shakings of little heads. A hunger strike was on, although drops of water were taken with evident relish. If it was Florida leafage that their inherited appetites required, they were doomed. But Arthur Stupka, park naturalist of the Smokies, solved the problem. A book from his shelves suggested pine needles. In the interest of amateur science, needles were supplied from the trees of the Park, whose growing things are not to be gathered under ordinary circumstances.

In due time, we left the Smokies and returned to our home, carrying with us the young imperials that had survived the hunger strike. Again a change of menu was necessary, and from the samples of foliage submitted the unanimous choice was arbor vitae. On this they thrived mightily, being supplied daily with fresh twigs sprinkled with water in place of dew and rain.

PUPA OF THE EMPRESS

When held in the palm of the hand it squirmed impatiently

The better to see them—and to see how they grew—the caterpillars were made to live in a glass house—an aquarium without the *aqua.* This was cleaned daily to remove waste, sticks and discarded velvet "robes," for, as the young imperials increased in size, even to the length of five inches, they cast off their outgrown skins and took on new ones better fitting their girth.

THE CATERPILLARS UNDER GLASS
The better to observe their feeding habits, growth and activities, they were placed in an old aquarium

After about six weeks, there was a gradual cessation of eating, and evidence of preparation for another phase of existence. In order better to observe this process, a buxom caterpillar was placed in a glass jar partially filled with white sand. Although somewhat baffled by the glass walls, it raised its body to an upright position and, by a rhythmic pounding with its anal shield, made a dent in the sand, at the same time draining the fluids from its body. Having completed this chore, it went head first into the sand, tunneling to the bottom, to make a cavity wherein to await destiny. A few days later, the last velvet robe was cast off, and not until then, when the imprint of wings could be seen on the naked body, was the sleep of the great change begun. The sand, being light in texture, caved in, so the pupa was removed. It squirmed impatiently at being disturbed, but soon quieted and evidently went on with the mysterious process of change. Five months later, a new creature emerged. In half an hour its folded wings expanded to the size and beauty of a moth like the one that had come to us and started the cycle.

The others went through the same behavior in the glass house. Imperials do not spin silken cocoons like the lunas and others, but go underground, or pupate on the bottom of a box in captivity. As each one completed the metamorphosis and found its wings, it seemed to stir around among the sleeping ones as if to urge them to awaken. The laziest and last one, almost a year after the parent's visit, was so listless that it was dipped in water several times to make it emerge.

Not all of the imperials came to perfect maturity, probably because of the frustration of their natural desire for underground sleep. The majority, however, emerged and became as lovely as Nature's pattern could make them in their dress of bright yellow gold with trimmings of orchid. They clung to the window screens in the sunroom, motionless by day, unless disturbed, but flying around at night. Some of the males were set free, but the females were carrying cargoes of eggs, and were too heavy to fly. One night a large imperial came beating against the window from the outside, giving evidence that he knew there were captive maids inside, but an effort to open the screen to let him come in only frightened him away.

No specimens were kept. The whole experience was such as to forbid the display of stiff, pinned moths as poor relics of a brilliant family. Records were kept and pictures taken, but the glint of gold cannot be caught by the camera.

Notes show the dates of the cycle of life of the children of the empress, from wings to wings: August 19, the moth came and began laying eggs at once; August 28, the eggs began to hatch; October 20, the last caterpillar went into the long sleep; March 1, the first moth emerged; August 5, the last of the moths emerged, and lived two weeks, thus rounding out a full year of intense interest in our study of the *Eacles imperialis*.

Our lives were enriched by this glimpse of the mysterious plans of the universe, which prepare a glorious destiny for even the most lowly creatures. It was like watching a pageant, while we served as stage hands; like turning the pages of one volume of a series whose numbers are countless.

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If I Were A Shadow

By E. F. HEYDINGER

If I were a shadow on the lawn
I'd gird myself at the break of dawn
For my task of the day, a quiet parade,
Across the grass from shade to shade.

If the leaves were wooed by the wayward wind
And they responded with sighs of kind,
I'd make from the grass a periwig
And then and there I'd dance a jig.

If I happened by a pansy bed
And spied a lass with lips of red,
I'd linger with the wistful miss
Until she gave me a hug and a kiss.

If I were a shadow on the lawn
I'd gird myself with the streaks of dawn
For labor and love, a quiet parade,
A jig and a kiss, ere the nightly shade.

It takes a lover of the desert to shed—

Light on Desert Lanterns

By CARLYLE ELLIS

THE ODD FORMATION OF DESERT LANTERN

There seems to be no set pattern for these, which gives them added interest, and there is no mass production of them

My neighbors call them Devil's lanterns, but that, it seems to me, is going too far. His Infernal Majesty is already credited with more than a devil's share of our desert wonders. No one can fairly object to the name of the infamous Devil's Golf Course in Death Valley, or the awesome Devil's Playground east of Barstow. He may also be entitled to a garden, in which case the Devil's Garden on the Whitewater, north of Palm Springs, should well suit his diabolical tastes. He should, too, be pleased with his holdings in Joshua Tree National Monument, where he is assigned a castle, a throne, a toyshop and the biggest tooth on earth—fifty feet high and of solid granite.

But I draw the line in behalf of our little lanterns. They are botanical favorites of mine, oddly decorative, varying in size and shape with engaging disregard for set rules, and peculiar to the southwestern deserts. Let us, therefore, call them desert lanterns and let the devil pick something really unpleasant.

These desert lanterns are the skeletal remains of the desert primrose, *Œnothera deltoides*. The plant, when it first comes into bloom, is a soft, stemless creature that sits flat on the barren-looking sand. The flower is pure white, about two inches across and delicately perfumed. It smells a good deal like its fragrant eastern cousin, the yellow evening primrose, but, unlike it, does not close at sunrise after one night of loveliness. When it does close the under sides of the petals have become light rose-pink, which harmonizes arrestingly with the soft, gray-green of the foliage. Thereafter the seedpod grows long, woody and pointed, splitting open and curling outward in tough, sharp spines.

When water and the right sort of diet are scarce the plant may go on blooming close to the ground for weeks, producing a bizarre, Medusa-like mop. When, however, the exploring tap-root can find something more, it sends out a circlet of side-stems, each with a blossom-bearing end. These, like the leaves, lie out almost flat. There may also be a stout, central stem. This blossoms profusely as it rises. It may, however, be able to secure only enough nourishment to lengthen two or three inches. The urge to blossom and bear fruit is so strong that all other growth is sacrificed to that. This powerful drive toward self-perpetuation, universal in both plants and animals, is Nature's premier wonder and it produces many other wonders.

There seems to be no set pattern for desert lanterns. They are not turned out by mass production. Indeed, not one plant in a thousand, where I have searched, turns into a lantern, and no two of these are alike. If the plant has stems, however, these grow woody and curl upward and inward, beginning as soon as growth is over. When they are really serious about it they keep this up until their spiny tops have interlocked above or around the central stalk. Then the result is a lantern. It may be sturdy and pumpkin-shaped, with an inner and outer ring of stems, or it may be slender and long-pointed. This does not seem to be a matter of species or variety. There are too many gradations from one form to another for that. Let us just call it the result of an unstable temperament.

There are also variations in color, but this is easily explained. The light sepia ones are of the current year's vintage. The gray ones have been weathered by at least one year's desert sun and rain.

The wide variation of form has scientific interest as an example of how much environment may count, even in the life of a plant. If the human body were as much influenced by food and drink as are these primroses we would be an even more weirdly assorted race than we are now. Imagine a human parallel to the following extraordinary case of primrose potency.

Last year Miss Elizabeth E. Morse, of the University of California, and I dug up plants at a spot in Antelope Valley, on the Mohave Desert, where the sand was almost

THE DESERT BLOOMS

A patch of desert primroses in Antelope Valley of the Mohave Desert. However, not one plant in a thousand of these will grow up to be a lantern

carpeted with the luminous white blossoms. Our specimens were in full bloom. They were packed moist and hurried to Berkeley to be dried as herbarium specimens.

Instead, they were planted in a well-watered garden of rich loam where there was full sunlight. Those that lived flourished and one made astonishing growth. When it stopped blossoming the central stem had reached a height of forty-two inches, and one of the laterals was fully two feet long. The lanterns on the desert are seldom a foot high and I have one, perfect in form, that is only three inches tall—small enough to be worn on the coat lapel. I returned later to the spot where the specimens were collected and could find only abortive forms.

The question arises to plague the inquisitive observer: Are these uncanny differences just a matter of water-supply; are there some soil constituents more favorable to stem growth than others, or are these differences inherited?

Perhaps it is not important, one way or the other, but we who live on the desert know something of the magic that may be wrought in vegetation just by watering, and can get quite excited about it. The nearest primrose field is eight miles from where I am, but do not be surprised if you find me out there among the sun-baked dunes with a watering can, off and on during the coming growing season. I want to foil the devil of drought on his native heath and see what happens. I yearn to grow my own lanterns. You would, too, if you could know the desert and its many charms.

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WILDLIFE SERVICE THREATENED—An Editorial

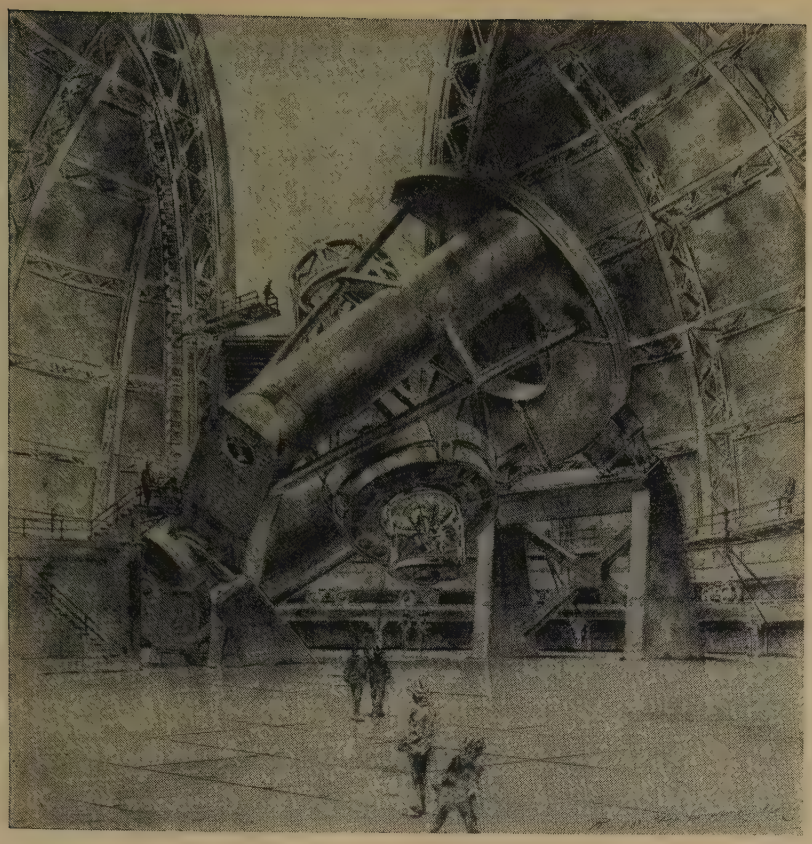
THE Fish and Wildlife Service, known for nearly 40 years as the Biological Survey and the principal custodian and defender of our living resources of the woods and waters, now faces the gravest threat in its long existence. Orders from Harold B. Smith, Director of the Bureau of the Budget, direct its removal from Washington to Chicago, Illinois. As we go to press, we are dependent on newspaper reports for particulars. Since these are meager, and give no reasons, we can only assume, from the source of the order, that economy of administration is sought. From an experience of nearly half a century with the organization and the work of this Bureau, we must view the removal of this Service from the Washington region to Chicago, or to any distant city, with the gravest concern. If economy be the end sought, this will surely not be attained unless by the abandonment of many most useful functions.

To understand clearly this point, one must consider the value and necessity of maintaining the closest possible relations with the many Government agencies in Washington now concerned with our wildlife, including especially the units charged with administering our Forests, Public Lands, National Parks, Reclamation, Water and Power resources, Erosion Control, and Water Pollution.

International treaties for the protection of wildlife necessitate close and frequent cooperation with the State Department and with Congress. Efficient interacting of all these agencies is made possible by the unparalleled library facilities that a century of Governmental administration has built up here in Washington.

If the efficiency of our Fish and Wildlife Service, including the protective programs that have been forwarded during recent administrations, is not to be seriously injured, all considerations demand that the Service remain in or near the Washington region. Removal to any distant city will necessarily result in the immediate loss of nearly half of its personnel, including many of those most experienced in its technical work. Those able to move will be faced with serious handicaps that will take years to overcome.

Our wildlife, already sorely beset, again needs the help of all its friends. A word to the wise should be sufficient.



THE 200-INCH TELESCOPE ON MOUNT PALOMAR IN SOUTHERN CALIFORNIA. DRAWING BY RUSSELL W. PORTER

You must have patience, tenacity, intellect, intelligence, and little concern for financial reward—

If You Want to Be an Astronomer

By ALICE BEACH

HAVE you the patience of Job and the tenacity of a bull dog? Is yours a superior intellect, reinforced by the valuable initials B.A. and Ph.D.? Do you know all the "tricks of the trade" used by expert modern photographers? Have you a special knack for understanding and handling complicated machinery, with perhaps a dash of inventive ability thrown in for good measure? Does the thrill of discovery and the keen sharp-edged pleasure of a satisfactory mental "tussle" mean more to you than financial success and the rewards of fame? Can your constitution and your temperament stand long tedious hours of night labor at sub-freezing temperatures? And, above all, can you "follow through" on tasks involving careful, intelligent attention to details, without losing your enthusiasm and your sense of proportion?

Perhaps this sounds like a description of some very rare species of human being. But unless you have all these capacities and abilities, or can develop them, you will probably find it difficult to become a professional astronomer.

Before you become too discouraged, let us call your attention particularly to that word "professional". In science, as in business, music, literature, or athletics, there is always room at the top for highly specialized skill and ability. But in astronomy the ranks are thinner, and the climb is harder. The champions in this fascinating mental sport are never developed suddenly. And it is only the champions who attain professional rating! This applies in the field of astronomy.

This does not, however, mean that there is no place in our complex twentieth-century world for non-professional astronomers. Amateurs derive many benefits from participation in athletic sports or the creative arts, and their contributions are often decidedly valuable in their own way, even though they cannot match the skill displayed by the "top-notchers".

So, if the study of the stars arouses your intellectual curiosity and wonder, by all means feed and encourage that interest in every way possible. Up-to-date astronomical books and periodicals can be found now in any public library or bookstore. Public speakers and radio announcers

DR. ALBERT EINSTEIN AND THE LATE DR. CHARLES E. ST. JOHN EXAMINING THE SOLAR EQUIPMENT ON MOUNT WILSON

report the latest news from scientific laboratories. Planetariums and observatories all have programs specially designed to appeal to the astronomically-minded layman.

Perhaps you will build your own back-yard telescope and learn to operate it efficiently. More than twenty-five thousand amateurs have successfully constructed telescopes—from six inches in diameter up—that are really capable of doing serious astronomical work. This need not be an expensive hobby. Materials for a telescope can be bought for a cost of less than $25. For three dollars you can buy the book called *Amateur Telescope Making,* published by *Scientific American.* This profusely-illustrated book for beginners tells you how to plan and build your mounting, and how to grind, polish, and accurately shape the essential glass parts by hand. If you progress beyond the beginner's class, a second book, *Amateur Telescope Making—Advanced,* published by the same company, deals with advanced mirror technique, flat making, eyepiece work, drives, aluminizing, and other interesting subjects.

While searching the skies you may—who knows—discover a new comet or a nova. Or, if you like, you can render valuable service to science by making observations of the zodiacal light or variable stars, or by sitting up through some long, clear, star-lit night to count and record meteors in a spectacular "shower".

All observatories have frequent requests from high school and college students, and sometimes from more mature individuals, for information on the vocational opportunities in the field of astronomy, and the best means of preparing for them.

Among the questions most frequently asked are: "How much preliminary training and experience must I have, and where can I get it?" "What salary can I expect to receive?" "How much value has astronomy in the present-day world?"

An honest answer to the first of these questions is apt to prove discouraging.

In the days of the Egyptians and Chaldeans, and even in the time of Galileo and Newton, the chief qualifications possessed by astronomers were a knowledge of mathematics and a keen and active mind. Astronomy was the first science known to man, but in its early days it became something of a problem child. Its friends and supporters were viewed with suspicion, and even occasionally thrown into prison or burned at the stake. Twentieth-century astronomy, however, presents an entirely different aspect. Grown now to the proportions of a large and lusty adult, astronomy has not only attained for itself prestige and distinction, but has become so closely allied with other fundamental sciences that to understand and cope with its problems demands a thorough and lengthy training in a number of different fields.

A college degree is absolutely essential. A Ph.D. is almost equally necessary. The preliminary training period for an astronomer consequently is almost as long as for a specialist in medicine. Mathematics and physics, as well as astronomical courses, must be thoroughly mastered. Knowledge of chemistry, engineering, photography, and optics will also prove extremely useful.

And, since astronomers spread their research—at least in times of peace—all over our globe, in close cooperation with all nationalities, the more languages you know, the easier you will find your future in astronomy.

As for the best places to obtain this training, almost any good university or college should be able to give the necessary undergraduate work. But for graduate work it is well to select some university with particularly brilliant and stimulating professors in astrophysics.

Astronomers seldom amass large fortunes. Their salaries are on about the same scale as those of college professors or educational executives. But opportunities for pure research in astronomy are, unfortunately, very limited.

If you are a woman, the law of averages here is decidedly against you. Here is one field of activity almost entirely monopolized by men. A few courageous women have stormed the gates and gained at least partial admittance. Alert, scientifically-minded women have rendered valuable service by teaching astronomy, or by assisting with highly technical, skilled computations and measures. But, largely because of the great size and weight of modern astronomical instruments, only a tiny handful of women have actually made observations and achieved fame for their own research efforts.

In the entire world today (Continued on page 108)

CARROT

The eighteenth in Nature Magazine's series of educational inserts

Rooting in the Root Cellar

By E. LAURENCE PALMER

Illustrated by Elizabeth Burkmeyer

CELERY

BEET

SALSIFY

GLOBE ARTICHOKE

HUBBARD SQUASH

PARSNIP

RADISH

CABBAGE

"THE MAN who has nothing to boast of but his ancestors is like a potato, the only good belonging to him is under ground". So runs one of many sayings drawing comparisons between men and the vegetables to be found in different kinds of root cellars. Interestingly enough, there is an almost identical saying in which a turnip is substituted for the potato. The Irish particularly have a number of sayings about root crops. They say, "Every Irishman has a potato in his head", and, "Never bolt your door with a boiled carrot". The slang for having "plenty of potatoes" suggests that they might be considered an article of exchange, and for all we know that may some time be only too real.

Even children's rhymes bring root-cellar vegetables into prominence. The chariot in which Cinderella "stepped out" was a mouse-powered, convertible pumpkin. Peter, the Pumpkin-eater used a pumpkin shell to keep his wife from "stepping out" too much. And so the story goes.

True appreciation of man's interest in pumpkins is found in Whittier's, "The Pumpkin", where he says:

"What moistens the lips and what brightens the eye?
What calls back the past like the rich pumpkin pie?"

Riley guarantees the pumpkin's place in literature by describing the autumn as the time when "the frost is on the pumpkin and the fodder's in the shock".

It is true that, technically at least, pumpkins are not root crops, but they are, or were, stored in the same cool place where the potatoes, turnips and beets found a temporary resting place. Nowadays, we recognize that it is preferable to keep the pumpkins where it is warmer, and that there is no one temperature or humidity generally suitable for storing fruits and vegetables until they can be used or sold. Some do best if they are placed near the freezing point and are kept from actually freezing by the changes that take place in them partly due to respiration. Others cannot withstand such severe treatment and must be cooled just enough to delay the processes that lead to decay.

These physiological changes that take place in stored carrots, pumpkins, beets and similar plants frequently have a considerable effect on palatability of the things stored. Usually, the most important change is that associated with changing starches to sugars. The consequent sweetening not only improves the crop for personal reasons but increases its sale value. For this reason, there has arisen a science of root-crop storage that has great economic importance. Essentially, this calls for harvesting the crop at a time when it has stored a maximum of the less perishable starchy materials, delaying the changes of these starches into sugar until just before the time of consumption, and then consuming the product before it has time to spoil.

Temperature control and ventilation are usually the most important factors.

Sometimes it is necessary to bring a root-crop product to its peak of perfection and then hold it there as long as possible. For example, where the product may not be expected to move rapidly once it is offered for sale, a few days may make great differences in the commercial value, the nutritive value and the general appearance of the product. When the product is expensive this may offer a severe situation to the merchant who may not be in a position to take much of a loss.

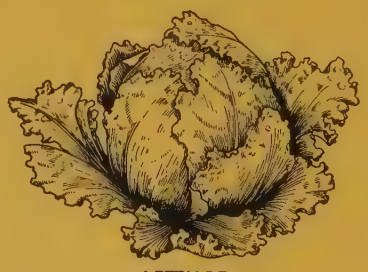
Delayed deterioration is sometimes effected by waxing the product. This is done by a thin, transparent coating of wax that suspends respiration, even though the temperature may be high enough to make it otherwise rapid. This is practicable only in the case of high-grade materials, and the process in no way improves the quality of inferior root crops. Topped carrots and cucumbers seemed to be among the things responding best to the waxing process, but most root cellar crops, except parsnips, can be waxed if they must be displayed long at higher temperatures.

Commercial waxing may be carried out by a hand-operated unit, which will handle from six to twelve bushels an hour at a cost of between three and four cents a bushel, or this may be done on a large scale at the rate of up to twenty bushels an hour at about the same cost. Where the root crops, vegetables or fruits are sold by weight this may be important since waxing greatly decreases loss. Also, where vegetables are put on display in exhibition halls waxing may be important. It improves and sustains the appearance of the vegetable. Where judging may be delayed for some time in a warm, humid hall, the waxing may make all the difference in the world in the decision of the judges.

Of the oranges shipped from Florida and California, 75 percent are waxed in some way. The percentage for root crops is not nearly so high. Waxing is done by a number of methods. In the so-called Canadian process, the dried products are dipped for a few seconds in paraffin heated to 260° F. They are then dried quickly. Other processes apply the wax with brushes, or by the use of atomizers, but the most promising method now followed is effected by dipping the washed but undried vegetables into cold-wax emulsions and then drying them quickly. Waxing does not stop the development of decay caused by bacteria or fungi. Waxed vegetables cannot be shipped well where they are kept cool by water dripping from melting ice kept in containers above them. They should be kept dry rather than wet.

POTATO

JERUSALEM ARTICHOKES



LETTUCE

PUMPKIN

Of course, the essentials of storage usually demand not only that the temperature be kept down and that adequate ventilation be provided, but in most cases light should be kept out. Light encourages growth development, which is not to be desired in these stored products. Potatoes stored in comparative darkness, at a temperature between 35° and 40° F., with the humidity low, produce a very small number of sprouts, which cause loss of weight and deterioration. At temperatures between 40° and 50° F. the largest number of sprouts seem to be produced. Sprouting seems to start about ten days earlier with potatoes stored at 50° F. than with those stored at 40° F.

Quick chilling of some vegetables is being practiced, but this is not so common as with the more perishable and juicier fruits. Since it entails considerable expense for the initial chilling and for the continuance of a freezing temperature until the article is ready for cooking or eating, it is not likely that vegetables will ever be "frozen" commercially to the extent that the higher priced fruits are.

Root crops and other plants commonly found in root cellars have a wide use to man and to his domestic animals. True, most of these are associated with food. Sometimes the natural plant part is eaten directly; sometimes it is processed; often portions of it are extracted for food and the balance discarded or used for other purposes. We eat celery, lettuce, radishes, carrots and onions with little or no processing, while we commonly cook potatoes, beets, turnips and spinach. True, we may cook the celery, carrots and onions, but this is not necessary any more than it is necessary that we cook the turnips.

The food-value of such crops as lettuce, beet-tops and spinach lies largely in the vitamins they contain. The value

ONION

of the potatoes lies largely in the starch, and the value of some beets largely in the sugar. The details of these food values are given in the material on each species in the chart section of this insert.

The extraction of starch from potatoes for use in making bread, or for some of the many commercial uses, is rarely appreciated by the layman, but it is considerable in its importance. The Germans are reputed to have watched the food changes that take place in a developing potato plant so that they know when to harvest it to obtain a maximum of food value, not only in the underground part but in the tops, which we neglect but which they use as silage and in other ways.

While the beet figured in this section and considered in the chart is the common garden beet, much sugar is extracted from the sugar beet. The development of these beets so that they produce a prodigiously high amount of sugar as compared with the wild plant is one of the outstanding examples of plant improvement by man. Around this single plant centers the prosperity of great areas in the West. Political as well as financial fortunes of many men have depended on it. Around it have centered some of the most bitter labor disputes, equally bitter battles involving protective tariffs, and no small amount of political intrigue in connection with rail rates, processing costs, irrigation policies and the like.

So narrow may be the margin of profit from the raising of some of these root crops, and so dependent are great numbers of our population on returns from labor connected with raising them, that a fluctuation of a small amount in shipping rates, in labor costs, and in market prices may cause serious upsets.

To the botanist, the plant parts found in a root cellar may be highly varied. There may be true roots, but there may also be stems, leaves, flowers and other parts. Were it not for the fact that in two of the most recently published and most popular series of elementary science texts the authors have exhibited wholly unjustifiable ignorance of the nature of these parts, it would hardly seem necessary here to review this angle of the matter. What the parts are technically is of wholly academic importance, but if one wishes to devote any time and space in a series of books to developing this academic appreciation of the morphology of plant parts the examples chosen as illustration should at least be what they purport to be. If we wish to illustrate what a stem is, we should not select the leaves of celery. If we wish to illustrate flower buds, we should not use asparagus stems, and yet these are only a few of many similar errors that appear in widely-used texts in "science" for children.

TURNIP

In this article, we have spoken loosely of things found in a "root" cellar, but we have not chosen them as examples of roots. We store potatoes in a root cellar, and asparagus, celery, cabbage, spinach, lettuce and globe artichokes. None of these are roots. The potatoes and asparagus are stems. The cabbage and lettuce, spinach and celery are leaves, and the globe artichokes are flower heads comparable to the head of a daisy or thistle or goldenrod. The writers of textbooks dealing with plants should at least know this if they deliberately set out to teach what roots, stems, leaves and flowers are. We have not chosen our examples in this article to satisfy the dictates of the botanist. If so, we would have had to omit about half of the things ordinarily found in a root cellar. In addition to those things already mentioned, we would have had to leave out the fruits of pumpkins and squash. This would leave only such plants as parsnips, radishes, beets, turnips, carrots, sweet potatoes and salsify for our article and this is not enough, nor is it representative of what one might find in a root cellar in point of volume. Probably more space is given over in root cellars to the storage of things that are not roots than to those that are.

ASPARAGUS

SWEET POTATO

SPINACH

To the layman, the part of a plant underground is a root, but to the botanist roots may be above ground and stems, leaves and even flowers may be under ground. If we accepted the layman's definition, peanuts would be roots.

The plants producing the contents of a root cellar have varied needs. Most of these are summarized in the chart section for each species. Some, like the sweet potato, must have a warm growing season, and some, like the common white potato must have a cool growing season. These (Continued on page 88)

COMMON NAME SCIENTIFIC NAME ORDER FAMILY	ONION *Allium cepa* Liliales Liliaceae	ASPARAGUS *Asparagus officinalis* var. *altilis* Liliales Liliaceae	GARDEN BEET *Beta vulgaris* Polygonales Polygonaceae	SPINACH *Spinacia oleracea* Chenopodiales Chenopodiaceae
GENERAL DESCRIPTION	Height of flower stalk to 4 feet, hollow, swollen below the middle, and much taller than the leaves. First year leaves basal, and hollow, developing the bulb in late season. Some varieties produce new bulblets from the bases of the larger ones; some produce bulblets instead of seeds in the flower; some produce regular flowers and seeds. Mostly biennial.	From 4 to 10 feet tall, with spring shoots succulent and thick, and summer growth slender and tough. Leaves, reduced to scales that are pressed closely to the stems, with slender stems assuming the role of leaves in the mature plant. Stems smooth, much branched. Roots of many cord-like fleshy parts springing from a more or less common center. Perennial.	Stem produced in the second year, to 4 feet high and bearing many small flowers. Leaves of the flowering stem, narrow and linear. The basal leaves are of different shapes, but are usually smooth, commonly green, with reddish veins and usually clustered close to the ground. The thickened root may, by finer roots, penetrate 6 feet of soil. Biennial or annual.	Height, to 2 feet, the stem being usually unbranched or only slightly branched. Leaves, smooth, green, large, those produced in cool weather forming a dense crown. Leaves of the flowering stalk, narrow, oblong and variable. Flowering stalk may branch from the axils of the leaves and flowers are borne on both the main stalk and the branches. Annual.
RANGE AND HABITAT	Native of Asia, probably from Palestine to India; mentioned in the Bible and reported as one of the things the Israelites longed for when lost in the Wilderness. It has been cultivated in America since 1629. In acreage, leading states raising onions commercially are Texas, New York, Michigan, California, Colorado, New Jersey, Massachusetts, Indiana, Idaho.	Native from Britain to central Asia and Africa, where it grows wild on coasts and in sandy regions. Escapes cultivation in America and may be found in a variety of places. Does best on deep, loose soil, sandy loam best for early crops, and should at all times be well drained since plant cannot long survive submergence. Usually planted 8 inches deep.	Probably a native of Europe; has been known as a cultivated plant since the third century. Sugar Beets and Mangels are common forms of beets and Swiss Chard is another variety. Some beets are grown for ornament and some for the use of their leaves as "greens." In Swiss Chard, the midrib of the leaves is greatly enlarged.	Native of southwestern Asia, with one of the four species being widely cultivated. In United States, California holds a leading position in growing spinach but it is grown commercially for shipping in 14 states and for local consumption in most states. In 1937, Texas had 50,000 acres of spinach; California, 16,720; Virginia, 6,800 and New Jersey, 3,000.
FLOWERS	Flowers many, lilac or white, in large, loose cluster springing from spreading bracts. Stamens 6; pistil 3-celled, with seeds black, spherical. May be grown directly from seeds, by using "sets" from tops of some varieties, by bottom sets springing from underground bulb, or by sets grown from seeds in hot houses. In North, commonly grown from seeds.	Plants bear either staminate or pistillate flowers, rarely those with both stamens and pistils. Flowers, bell-shaped, borne in groups of 1 to 4, in axils of leaf-like stems. Staminate flowers, yellow-green, ¼ inch long; pistillate, smaller, and with 3 longish stigmas. Fruit, a berry, under ½ inch through, turning from green to red and bearing about 3 seeds.	Flowers numerous, in an open-topped, branching arrangement, greenish, with 5-parted calyx, 5 stamens, and a sunken ovary that bears 3 stigmas. Usually, 2 or more flowers become grown together to form a "fruit" in which the true "seeds" are developed. Each seed enclosed in a thickened calyx. The seeds may retain their ability to germinate for 5 or 6 years.	Flowers usually either staminate or pistillate, with some bearing both stamens and pistils. The stamen-bearing flowers are usually found on leafless spikes, and the pistil-bearers in leaf-axils. The fruits are enclosed in structures bearing 2 to 4 spines, are small and generally inconspicuous. Considerable variation in the different strains cultivated.
CULTURE	In South, seed is planted in September at rate of 30 pounds per acre, but 17 pounds of seed per acre of hotbed should produce enough sets to plant 10 acres in rows 14 inches apart. Transplanting generally gives better results than direct growing. Large sets, to 1 inch in diameter, may produce a yield of 94 bushels to the acre, while small sets under ½ inch may yield but 9 bushels.	If soils are acid, liming may be necessary. Doubtful if use of salt in controlling weeds is desirable. Seeds germinate, 2 to 6 weeks at 86° F.; may be soaked to 3 days. Staminate plants yield 25% more crop, but pistillate yield larger spears, a year-old staminate plant yielding 26 spears, first spears appearing, in East, at 2 years. Should produce for 20 years with good care. Enemies, rust and beetles.	Seeds may be planted in boxes for early greens to be transplanted in garden in rows 24 to 30 inches apart. Seed sown in drills in fields requires 4 to 6 pounds to acre. Seeds are produced when plants are subjected to a temperature of 40° to 50° F. for 15 days or longer. Roots may expand at or above surface. Hand cultivation is expensive, possible only where market high and labor cheap.	When grown in rows, seeding requires 4-6 pounds per acre; broadcast, 8 to 10 pounds. Rows 10 to 24 inches apart, and plants thinned to 5 inches. For Texas, winter crop seed is sown September to January; for fall crop in North in late summer. Diseases include spinach blight or yellows, downy mildew, and leaf-spot, checked by good fertilizer and care.
ECONOMIC IMPORTANCE	Onions are most important American bulb crop, with 93,474 acres given over to commercial production in 1937 and averaging for 20 years around 160 100-pound sacks per acre worth a total of around $17,000,000 for each five-year period. The food value is high and the popularity of the onion as food is well established and sustained, so there is a dependable market.	May yield over 2 tons per acre. Price increases ¼ base price for every inch of succulent shoot above 3 inches. Food value of shoots is decreased with removal of summer tops. Grading, washing, packing, bunching may increase price. Fresh shoots, preferably green; those to be canned, often blanched. Fresh shoots toughen rapidly first 24 hours, unless cooled before shipped at ordinary storage temperatures.	Beets with root diameter of 1½ inches are bunched and sold, or larger roots are stored through winter at 32° F. or in outdoor pits or banks such as were used in the earlier days. Beets are also raised for canning. 1937 crop in United States was about 19,150 acres, with a cash value of $1,454,000, these figures referring to beets grown for canning and shipment to distant markets.	Grown for marketing and for manufacture, importance being reflected in acreage of 13,680 in 1919 and 106,340 in 1937, about one-third being grown in later years for manufacture. Importance of salts and vitamins produced to average diet has been emphasized. "Pop-eye" has helped popularize it with many children. In shipping from California to East, usually requires about ⅔ its weight in ice.

CABBAGE *Brassica oleracca* var. *capitata* Papaverales Cruciferae	TURNIP *Brassica rapa* Papaverales Cruciferae	RADISH *Raphanus sativus* Papaverales Cruciferae	CELERY *Apium graveolens* var. *dulce* Umbellales Umbelliferae	CARROT *Daucus carota* var. *sativa* Umbellales Umbelliferae
Leaves in center form a compact head, the leaves themselves to a foot across and nearly circular; the outer coarse, green, and more or less flat; the inner paler, more tender and making the head. Varieties of the species include Brussels Sprouts, Cauliflower, Broccoli and Sprouting Broccoli. Root is relatively deep. Biennial or perennial.	Leaves, clustered around the base, with clasping bases, or along the flower stalk. Those near the base commonly are narrow in general outline, and softly prickly. The root is a tap-root, usually white fleshed, and not produced into a slender crown at the top, but rather conspicuously flattened from above and often colored where above ground. Biennial.	Height of flowering stalk, to 3 feet. Leaves, stalked and roughened with sharp hairs, or smooth, with lateral segments paired, and the terminal segment the largest of all. Root, thick, fleshy and variously colored, dependent upon variety, with a sharp taste which makes it delicious if it is grown rapidly. Annual or biennial.	Height, to 3 feet, stems being branched, grooved and jointed. Most commonly eaten part is petiole or leaf-stalk, not stem, though this is edible. The root-leaves are crowded upon a short stem before flowering time comes. The leaflets are usually in 2 or 3 pairs, with a terminal one besides, and each compounded. Biennial or perennial.	Height, to 3 feet, with top much branched, and more or less bristly. Leaves on long peticles, finely divided so that the finer segments seem to be almost linear. The root is a thick, coarse, yellow orange taproot, which penetrates deeply into the soil and becomes swollen during the first year, losing its size when the plant flowers. Annual or biennial.
Grows wild on chalky seacoasts of England, in Denmark, in northwestern France and in Greece. It was introduced into cultivation in European gardens in the ninth century and is known to history back to 2,500 B.C. Favors a cool, moist climate, so in South is grown in winter. It has little soil preference but does best in sandy loams except in late summer.	Grows wild in Russia and Siberia and may have originated there. Is known to have been introduced into America in 1609 in Virginia. It is essentially a cool-season crop, being raised in the North in the summer and in the South in winter or as an early season crop in the North occasionally.	Native of Europe and Asia, and under cultivation and prized in the days of the Pharaohs and the ancient Greeks. It is grown commercially in the United States, particularly in Mississippi and California, and in other southern states. It is grown in most home gardens for home consumption and as offering an early return for garden efforts. Best in light soils.	Native of marshy places from Sweden to Algeria, Egypt, Abyssinia, and in Asia to the Caucasus, Baluchistan and mountainous India. It has been found growing wild in California, Terra del Fuego and in New Zealand. It was first grown for food in France early in the seventeenth century. Many varieties suitable for different climates and conditions.	Native of Africa, Europe and Asia; widely spread and naturalized in America. Some species of carrots are native to North America. The plant was cultivated by the ancients but has proven most popular as a food plant in America and Europe. It does best in deep, loose, loamy, rich soils, the large yields of early crops coming from sandy soils.
Flowers in long clusters, are whitish yellow, sometimes the flowers being produced only in plants that have been subjected to low temperatures. Plants not cooled known to produce 3 heads in one year and 6 heads in 2 years. These plants then taken to a cool area produced flowers and seeds as would normally have happened. 2 months' cooling best.	Flowers, small, under ½ inch long, yellow; those with open flowers usually closely crowded and topping those not yet open. Fruits, about 1½ to 2½ inches long, with a long slender beak at the free end, which are like little spheres, germinate quickly as is the case with many relatives of this plant.	Flowers, white to lilac, or blue, with four petals appearing after flowering stalk has developed and after root has stored its maximum of food reserve. Fruit is about 3 inches long, rather spongy, and contains from 1 to 6 seeds. It has a rather long, slender beak and does not split to free seeds naturally. Seeds are round.	Flowers, white, small, borne in clusters on stems of irregular length among the leaves, and springing from the joints in the stems. Fruits, small, compressed and prominently two-angled, with large oil tubes showing in section. Seeds are commonly soaked before planting, particularly for a late crop, and should not be dried too thoroughly in storage.	Flowers, white or yellow, small and very numerous, bearing both stamens and pistils. Fruits are small, flattened on one side, and with weak-spined lines on the other, with oil glands under these secondary ribs. Three pounds of seed needed for planting an acre that is to be cultivated by hand in rows 18 inches apart.
In North, seeds are sown in hotbeds in January, transplanted to 2 inches apart, and then transplanted into field. For late crop in North, seed sown 6 to 8 weeks before transplanting. One pound of seed provides for 4 acres if seedlings grown in greenhouse. Should be "hardened" to withstand temperature to 17° F. for short duration. Storage is most successful at 32° F.	Seeds planted where plant is to mature; if planted early in season, plant may be grown as an annual. Do not do well in hot weather. Seeds, planted ½ inch deep, in rows 12 to 24 inches apart, at rate of 2 pounds to acre; plants thinned to stand from 2 to 6 inches apart in rows. Removed plants are used as greens. Young turnips are bunched and sold or mature roots stored.	Roots may be ready for harvest 3 weeks from the time the seeds are sowed. Best practice calls for several plantings at intervals of 10 days, so new, fresh roots will be coming to maturity for home use. Winter varieties should be planted in late summer and may be stored for use in winter. When planted for commercial crop, rows are 12 inches apart; 12 pounds of seed per acre.	Seeds, commonly sown 8 to 10 weeks before transplanting into field. In North, transplant at beginning of hot weather and stored when developed sufficiently. In South, seeds sown early summer, shaded in part to conserve moisture. Two ounces of seed sufficient for one acre where grown in single rows, 3 feet apart. Transplanting is done shortly after a month after sowing.	Seeds covered to depth of ½ to ¾ inches, the lighter soils favoring deeper burying. Quick maturing varieties may be harvested from seed sown 2 months before a killing frost; others require to 5 months. ¾-inch carrots are harvested and sold in bunches. They keep well for 6 months at a temperature of 32° F., deterioration being due largely to loss of sugar in respiration.
Probably most important crop of genus *Brassica.* Grown in market gardens throughout United States, but winter production has increased greatly in South. States leading in acreage in 1937 were Texas, 36,000 acres; New York, 30,000; Wisconsin, 16,700; Pennsylvania, 10,500, and California, 8,200. Average price per ton about $16. Shrinkage varies from 7% to 27% with temperature, ventilation and time.	Experimentally, turnips sowed in drills yielded 30 tons compared with 14 tons yielded when seeds were broadcast. Make an excellent food for people without good storage facilities, because they grow easily, store well, have a good food value and require relatively little care. In North, popular varieties are Purple Top Globe, White Milan and White Flat Dutch; in South, Seven-top.	Where root maggots and aphids may be controlled, and a quick growth can be guaranteed, radishes may make a good cash crop. They are tied in bunches of 6 to 12 and shipped like spinach, while the winter varieties are shipped like turnips with the tops being removed before they are put into storage. Slow-growing plants are tough and strong.	Celery is a most important field crop in some parts of the country. Storage room temperatures should be about 32° F., the celery itself averaging 2 to 3° warmer than the room. Storage may be had by burying root in cellar, by trenching in the fields and covering plants with a mulch. In commercial storage plants, marketable celery may be held over 2 months in safety.	United States crop of commercially grown carrots in 1937 was 38,500 acres, or 5 times that of 14 years earlier. The food value of the root is high. Ten tons of carrots will remove from the soil 100 pounds of potash, 32 pounds of nitrogen and 18 pounds of phosphoric acid. The yield in acid soils is very low or negligible.

COMMON NAME SCIENTIFIC NAME ORDER FAMILY	PARSNIP *Pastinaca sativa* Umbellales Umbelliferae	POTATO *Solanum tuberosum* Polemoniales Solanaceae	SWEET POTATO *Ipomoea batatas* Convolulales Convolulaceae	FIELD PUMPKIN *Cucurbita pepo* Campanulales Cucurbitaceae
GENERAL DESCRIPTION	Stems with flowers, to 5 feet high, hollow, grooved, branched, with leaves compound, of 3 or 4 pairs of leaflets, and an odd leaflet at the end. Plant mostly smooth. Large root may become 20 inches long and over 4 inches in diameter, with finer roots penetrating much deeper into the soil; usually thickest at the top. Biennial or perennial.	Height of stem, to 3 feet, usually weak, pungent, somewhat sticky, with characteristic odor. Leaves, to 10 inches long, compound, with odd number of leaflets, and larger pairs often with smaller pairs between. The underground tuber is a stem which we eat; the eyes being rudimentary buds. Details shown in the drawing. Biennial.	Long, slender, trailing stems, with milky juice, thinly hairy, rooting at different points and springing from a deep tuberous root. Leaves varying greatly even on a single plant; some heart-shaped, some oval, and some deeply lobed. The juice of all parts is milky to some extent.	Long, trailing vines, the coarse leaves being prickly, and with deep notches between the lobes, unlike the leaves of Summer Squash and Winter Squash. The fruit-stalks are five-sided, hard, regularly grooved, and without a flaring part at the point of attachment to the fruit. The leaves more or less erect may be a foot across the blade. Annual.
RANGE AND HABITAT	Native of Europe; cultivated before the Christian era. Now grown widely in cool-temperate climates. Grows best in deep moist soil. When escaped from gardens it loses its thick roots, sometimes becomes an annual, and may prove to be a troublesome weed.	Native of temperate parts of Andes in South America but widely introduced throughout world and serving as a staple source of starch for food for man and cattle in times of war and in times of other food shortage. A blight of potato crop in Ireland in 1846 caused terrible famine. Does best where there is cool growing season, this being more important than soil.	Native of South America and probably cultivated by native Americans thousands of years before Columbus. It was apparently known in China before the Christian Era. It was carried to Europe from the West Indies in 1526 and was grown in Virginia as early as 1650. It requires a long, warm, growing season, with only moderate rainfall, particularly in early stages.	Pumpkins are probably of American origin, remains having been found among the relics of the cliff-dwellers. Some contend, however, that they are of Asiatic origin. We do not presume to decide which is right, but there is little doubt that Pumpkins were cultivated in America as early as 1500 B.C. and plants now growing wild in Texas resemble them.
FLOWERS	Flowers yellow or red, in compounded bunches, and are developed the second season with the exhaustion of the enlarged root produced the first season. Seeds slow to germinate. The fruits are smooth, decidedly flattened, with broad margins, usually straw-colored. Seeds remain viable only about 1 or 2 years.	Flowers, white to bluish, somewhat star-shaped, borne in clusters on rather long, drooping stems, 1 to 1¼ inches across. Fruit, which is infrequently produced, is a yellowish green, ¾-inch berry, globular and with 2 or 3 cells containing a number of seeds. "Seed" potato of commerce is a tuber or a piece of tuber, not a true seed, and is used as common means of reproduction.	Flowers resemble those of the morning glory, being funnels of rose, violet or blue with darker centers, about 2 inches long, with sepals of the green enclosing calyx about ½ inch long. The seeds are angular, smooth, dark and enclosed in a thin, fragile, spherical fruit which breaks easily.	Flowers, yellow, with long, pointed lobes. The seeds have a horizontal or rounded scar unlike the slanting scar of Squashes and, if there is a margin present, it is the same color as the rest of the seed and not of a different color as in Summer Squash. A short growing season is sufficient if the soil is well drained and they will grow in less fertile soil than melons.
CULTURE	Parsnip seeds are planted where they are to grow to maturity at the rate of one ounce for every 200 feet of row, or 3 or 4 pounds to acre when rows are 15 inches apart. Radish seeds often sown with parsnips, since they develop to maturity before interfering with the parsnip. Parsnips delicate when young, and do not stand weed competition well.	Seed potatoes grown in North are commonly used in south but northern farmers must grow own. Some seeds grown by planting second crop late, and getting vital stock in which yield is not high and therefore expensive unless cash is not available for buying seed outside local area. Usually, more profitable to cut potatoes into sections and plant pieces; whole potatoes larger than hen's egg are better.	Commercial cultivation is by means of slips or plants produced by roots or by simple cuttings of vines. Requires from 6 to 8 bushels of "seed" roots to set an acre though quantity varies with size of slips. Large roots produce fewer plants per bushel of seeds than do small roots. In commercial practice, roots must be disinfected before planting to kill fungus that causes rot.	Seeds are usually planted in hills about 4 or 5 feet apart, or in rows in which the plants are separated to 3 feet apart. They are often planted in hills with corn since they can survive the shade provided by the corn and use the same soil at the same time. The fruits may be turned from time to time as they develop to assure a well rounded evenly colored pumpkin.
ECONOMIC IMPORTANCE	Parsnips not grown extensively as a commercial crop, but may yield over $250 to the acre, much of which would of course be absorbed in labor costs. Their deep roots make them expensive to harvest. Their quality improves with storage, those stored 2 weeks at 34° F. equalling others left in the field 2 months longer. The change is from starch to sugar, mainly sucrose.	In 1935, over 3,500,000 acres in the United States were devoted to potato raising, yielding on the average 112 bushels per acre worth a total of $403,420,000. Germany in war times uses the tubers for food, the tops as silage for cattle, thus a basic food source. Germany, England, Maine, New Brunswick have ideal climates for potatoes.	Georgia leads in production of Sweet Potatoes with 114,000 acres planted in 1937. 80% of the total crop is produced by Georgia, Alabama, Louisiana, North Carolina, Mississippi, South Carolina, Tennessee, Texas and Virginia. Improvement in storage methods has made it possible to have this valuable food available to a wider market since much was lost by decay formerly.	Pumpkins may be stored successfully for several months, but temperatures should be between 50° and 60° F. rather than lower, although it depends upon how long it is best to keep them. At higher temperatures, weight loss is greater and decay more rapid than at temperatures between 40° and 52° F. Pumpkins are also raised for feeding to cattle and pigs as well as for man.

WINTER SQUASH *Cucurbita maxima* Campanulales Cucurbitaceae	JERUSALEM ARTICHOKE *Helianthus tuberosus* Campanulales Compositae	GLOBE ARTICHOKE *Cynara scolymus* Campanulales Compositae	LETTUCE *Lactuca sativa* Campanulales Compositae	SALSIFY *Tragopogon porrifolius* Campanulales Compositae
With long, trailing vines much like that of Pumpkin. The leaves are not prickly as they are in Pumpkin, and the lobes of Winter Squash are rounded rather than pointed as in Summer Squash. White spots are supposed to be absent on the leaves of Winter Squash. The plants feel softer than do those of Pumpkins. Annual.	Height, to 10 feet, the stems coarse, tough, hairy, with leaves opposite or alternate above, rough above, with winged leafstalks. The underground stems or rootstocks produce the tubers, which are used for food. In improved strains, these may be 4 inches long, weighing to 4 ounces each and contain an abundance of starchy food. Perennial.	From 4 feet high, coarse, thistle-like, except that in this species, leaves are hardly at all spiny and bracts of head are unarmed while in Cardoon, *C. cardunculus,* leaves and bract tips are spiny and the latter plant may grow over 6 feet tall. Leaves, large and variously lobed. Rootstocks, produce offshoots after crown of year dies. Perennial.	Stem, to 4 feet high, well supplied with leaves, branching above. Basal leaves, crowded, to 10 inches long, forming a more or less compact ball depending on variety, and varying in texture, shape and color. Root, relatively deep. Varieties include 3 classes; butter, including Boston lettuce; crisp, including Iceberg; and Cos. Annual.	Height, to 4 feet, the leaves being keeled like a boat and tapering to clasping bases that are rather broad; in fact, the leaves look almost grass-like. The plants are smooth, dark green, and have long, relatively slender taproots somewhat resembling those of parsnips. It is a biennial which requires a long first season to succeed.
Probably native of America, like the Pumpkins. The variety names, Boston Marrow, Mammoth Chile, give some indication of the range over which the plants have been developed. They are grown in some of the southern provinces of Canada and throughout the United States. They do not require a long season and they do well on a variety of soils.	Native of Canada and the United States, where it was grown by the Indians before the arrival of the white man. It is grown through Europe, Asia and through temperate parts of the Southern Hemisphere, and can be grown throughout the United States. In France, it is planted on soil too poor for potatoes. Potash is important and the soil should be well drained.	Native in southern Europe and northern Africa and grown extensively, particularly in France. Popularity in America varies greatly. Has been cultivated in the South for over 100 years. Enjoys a wide range of soils but does best on fertile, deep, well-drained areas. Must be protected in winter from heavy freezing by a cover, coal ashes proving popular.	Native of Europe and Asia, but has been under cultivation for 2500 years being mentioned by writers in 500 B.C. Centers of commercial growing of lettuce are California and Arizona, but it is grown in almost every home garden wherever man lives and maintains a garden. It favors a cool growing season, and to do its best has rather definite requirements for water.	Native of southern Europe and escaped in various parts of the world including North America. It is also found in north Africa and central and southern Asia in closely related species, most of which are also cultivated to some degree. Known to have been cultivated since 1600 in southern Europe.
Flowers, yellow funnels with the sides of the tube parallel or bulging towards the base. The fruit stalks are soft, spongy and yield easily to the fingernail, unlike the hard stalks of Summer Squash and Pumpkin. The seeds are white or brown, with a slanting scar and with the margin colored like the rest of the seed.	Flowers, in sunflower-like heads, 2 to 3 inches across, are few to many and usually are found at the ends of the branches. Ray flowers are conspicuously lighter yellow than the yellow disc flowers. The disc flowers represent both sexes. The fruits are dry, seed-like, flattened, brownish to black; they shed early the structure which corresponds to the down of thistles.	Flowers, borne at the ends of the main stem and of lateral branches, in heads to 3 or 4 inches through, with a fleshy base, and with thick bracts or scales. Flowers of Cardoon, purple. Plants grown from seed do not "come true" so usual reproduction is by the underground crowns. Fruits, thick, smooth, 4-angled, seed-like.	Flowers are borne in erect yellow heads, open in forenoon, close in afternoon, and produce a flattened seed-like fruit, blown by wind with help of downy parachute. Fruit, either strawcolored, brown or black. 12 to 16 flowers or fruits per head, fewer than in related sow thistle. High temperatures cause premature seeding and lessen commercial value.	Flowers, purple or yellow, in large heads, which close to form pointed cylinders, open in the morning but closed by noon. Fruits, stick-like, and crowned with a feathery down that serves as a parachute to help in distribution by the wind. The down is yellowish. The flowers are enclosed by the green case except when it is expanded.
Seeds usually planted in hills, often with other field crops such as corn; in which case, they require no extra cultivation. They are sometimes started in boxes and transplanted but this is rarely necessary or even desirable. There are a number of insect pests and fungus diseases as is the case with most members of this family, a wilt being among the worst of the diseases.	Planting is done in fall or in spring, tubers being either planted whole or cut into portions as are potatoes. Plant tubers 18 to 20 inches apart in rows 40 inches apart, small sized tubers requiring from 6 to 7 bushels to an acre. Plants are vigorous and able to take care of themselves. Good lazyman's crop except that they require digging for harvesting. General treatment, similar to that of potatoes.	Young plants selected when about 12 inches high as offshoots of parent plant, avoiding injury to parent root system. Roots, set 6 to 8 inches deep 6 feet apart, 8 feet between rows and cultivated. Freezing during growing may be fatal; heat may cause buds to open, ruining marketability. Greatest production, in plants 2 to 3 years old; plantings, renewed every 4 years. Manure unsatisfactory mulch; causes rotting.	Seeds do not germinate well at above 80° F. so may be iced 4 days before planting. Seeds 2 pounds per acre, when rows are 14 to 18 inches apart, and thinning is to be to 10 to 18 inches between plants. Thinning should not be delayed. Cultivation avoided when plants get well grown and should be shallow. Can be stored at 32° F., if not harvested after rain, for from 3 to 4 weeks.	Seeds are usually sown in drills from 12 to 15 inches apart and the plants are thinned to be about 2 inches apart in the row. The necessary long season makes it the usual practice for the roots to be dug in the winter but some are dug earlier and stored, as are Beets, Turnips, Parsnips and similar root crops.
Winter Squashes store better and longer than do Pumpkins. Small squashes to constitute individual servings are gaining some popularity. Ordinary cold storage rooms with their high humidity are unsuitable for storing Winter Squash. Stored squash becomes sweeter because of conversion of starch to sugar.	Jerusalem artichokes are commonly grown as hog food, the harvesting being left to the hogs. In large scale harvesting by man, plants are cut and the digging done with a machine. Plants produce, in their tubers, levulose sugar which is sweeter than cane sugar or than glucose. Carbohydrate inulin is found in tuber and levulose is supposed to be of value to those suffering from diabetes.	Large buds are most desirable, so grading and packing is done, heads being packed in paper-lined boxes. Long-distance shipping in refrigerator cars with usual icing common for lettuce and similar vegetables. In desirable marketable heads, stem is cut about 1 inch below base of head. Old stems are cut off after last bearing, burned, used as silage or buried in field for green fertilizer.	Value of lettuce raised in United States in 1937 greater than for any other vegetables except tomatoes and potatoes, the leading states being California and Arizona, which produce about 80% of the commercial crop, followed by Colorado, New York, Washington and Oregon. Its harvest, storage and shipment play an important part in current labor problems.	Because of the "oyster" flavor these plants are popular with some people, but they never hold an important place in a commercial market. Their general value probably warrants more general use than they get. The roots are marketed in bunches which are usually tied at each end with the tufts of leaves showing at the end. About 10 roots make a standard bunch.

(Continued from page 83) limitations restrict somewhat the parts of the world in which each may be grown. The great potato-raising parts of the country must have relatively cool summers and must have relatively dry soil but not too dry. These conditions are not at all suitable for the sweet potato, the globe artichoke and some others.

The popularity of certain root-cellar plants is difficult to explain. We pay high prices for globe artichokes and fail to use the wild Jerusalem artichoke. Of course the two plants are not closely related, and the parts eaten vary even more, but why should we be willing to pay a high price for something of less nutritive value than a thing that grows wild and could be raised very cheaply? With a possible sharp increase in the cost of living there may be a very real reason why we should learn the food value of our wild plants, which may relieve the demand for the cultivated plants that we may not be able to get.

Some of the wild plants closely related to our cultivated plants have properties that, unfortunately, are radically different. The root of wild carrot is purported to have poisonous properties, while dieticians sing the praises of the cultivated carrot. Botanically, there is only a varietal difference between the two plants. Wild parsnip, too, is believed to have poisonous properties, and yet the cultivated variety has important food value.

Of course, the ancestors of many of our cultivated root cellar plants do not grow in America. They come from other parts of the world where the climatic conditions are comparable. Some are Asiatic, some European, some African and some South American. A few come from more northern climes, and some from the tropics, but through the process of plant selection and breeding man has been able to make a suitable variety to grow in the regions where the greatest concentrations of population of the human species are to be found. Possibly if this were not so, such concentrations would be impossible and the human geography of the earth would be vastly different.

Some root crops are suitable forms of stored food for use by explorers and others who must carry some food with them. In general, however, this is not so. The grains usually give a great food value per unit of space and weight, both of which are important where the food must be carried. This is not so important in all ocean journeys and so we find potatoes popular with sailors. Incidentally, they supply a certain nutritive value necessary for a balanced diet and not available from food taken directly from the sea. In overland expeditions, this is not so serious since something of comparable food value can almost invariably be collected locally and so the potatoes or other bulky vegetables need not be included in pack trains. Some vegetables are dried and powdered for use in camp diets, but this is not a common practice. The man who must carry his meals for a week on his back much prefers a pound of rice to its equivalent food value in potatoes.

Probably no small part of the contribution of root crops to human health and happiness lies in the part these plants play in providing exercise for the man or woman who keeps a home garden. Radishes, beets, lettuce, turnips and the like look nice in a garden. They are easily grown. They mature relatively quickly. They require a little physical exercise in the planting, cultivation and harvest. While their consumption in excess might conceivably expand the waist line, this is hard to believe, and there is no doubt that the culture of the plants has reduced many a waist line in a most wholesome way.

Of course, the culture of root crops of the garden does not lie solely in the cultivation and preparation of the soil. There are many organisms among the insects and the fungi that appreciate the food value of these plants as much as we. Often it is quite a race as to which will make the harvest. The war between man and these creatures is without quarter. Each will take everything he can get irrespective of the interests of the other.

Man's commonest weapon in this battle is a poison of one sort or another. This he places on the plant where it may be eaten with the plant, or it may be placed on separate baits which may attract the villains from the plants. In some cases, the method of attack is that of strangulation by means of some emulsion that forms a film over the breathing organs of the insects and kills them in that way.

The whole business of managing the battle of the gardens calls for considerable generalship. With the fungi, the destructive spray must be put on at the time when the fungus can be killed on the surface of the plant. Once it is on, it may be washed off by a rain, or if it is not washed off it may with the help of the sun form a blisterlike injury to the plant it was designed to protect. For this reason, the sprays must be put on just at the right time and in the proper strength. Sometimes, sprays are used to destroy weeds growing among cultivated plants but this is not so easy since the sprays are not always selective. Where one wishes to destroy a hair-covered mustard growing in a field of smooth-leaved peas, the spray may stick well to the mustard and roll harmlessly off the peas but things are rarely so simple as that.

Generally, it is possible to get from the local Farm Bureau, or from the State Agricultural College, material more suitable to local needs than could possibly be recommended in an article of this sort. For that reason, the responsibility is shifted to them.

There are many other human interests associated with a root cellar. Of course, at Hallowe'en we all like to see Jack-o-lanterns gleaming at us from some window. Aside from this, the author is not impressed by the usual attempt to dress up garden vegetables to resemble men and women.

There is plenty of beauty in a bunch of carrots or beets if they simply pose as carrots and beets and you do not have to try to make them over into something else. Interior decorators of banquet tables frequently use wholesome healthy vegetables for decorations and it would seem that this is worthy of encouragement. Let's try to see beauty in things as they are and not try to make them over into poor images of ourselves. Each thing has its place, and the contents of a root cellar have their place in satisfying the eye's demand for beauty just as they have a deserved place in satisfying the stomach's demand for a meal. Let us try to make the most of our experiences rooting around in a root cellar. Altogether it well repays us for our time.

As We See It

SYMBOLS OF ★ OUR FREEDOM

Americans today face one major task—attainment of victory over the forces of ruthless aggression seeking world domination. This means fighting, both by soldier and civilian. We are all in the front line, according to the blueprints of war as the dictators have drawn them. And in this fight against aggression we have allied ourselves with other freedom-loving nations.

We Americans certainly have something worth fighting for; something worth the sacrifice that we must make. Our freedom, bought a century and one-half ago by similar sacrifice, is at stake. Nothing can be more dear. But other by-products of that freedom—creations of a democratic form of life—are threatened. These are, perhaps, more tangible, more symbolic even than the freedoms reserved to us as a people under the Bill of Rights.

Americans can point to many things that exemplify our way of life: our democracy; the participation of all the people in common national property. Such creations as our systems of National Parks, National Forests, and National Wildlife Refuges are products of this democracy. They represent a heritage acquired by the people themselves, and which are maintained that they may be passed on to the generations to come. They are symbolic of faith in our way of life, and in its endurance.

We Americans—one hundred and forty millions of us—all are part owners in a land lavishly endowed by Nature with natural resources of metals, oil, forests, waters, and scenic grandeur. In past years these riches seemed so limitless that too often they were abused, misused, or spent with wanton prodigality. Not too late, however, we adopted a policy of conservation and wise use of the tremendous resources still remaining. We set aside the National Parks and surrounded them with safeguards for their preservation against unwise use. We established great National Forests and applied to them principles of management that make them a perpetual resource. We launched a system of refuges for wildlife that represents a long stride forward toward maintaining our bird and mammal species in numbers proportioned to their habitats.

Americans, in doing these things, have shown vision. We have recognized values and translated that recognition into national policies. Having done these things, and, thereby, built soundly and logically upon the foundations of democracy, we have created specific things that crystallize and symbolize our defense of the United States of America.

"All out" for war is the proper and necessary slogan to achieve the certain victory that will be ours. We cannot stint, as a nation or as individuals. But in carrying out the task before us we must not lose sight of the tangible and spiritual values we have created. To do so would make our fight pointless. Continued concern for these values—continual interest in the things of Nature that make our country physically what it is—will make the fight easier and the sacrifices less difficult.

The leaders of our Army and Navy have wisely recognized the importance of such a viewpoint. They have collaborated with the governmental agencies that have these national resources in charge. They have thus far, with few exceptions, sought to reconcile the complex needs of training for modern warfare with the established conservation principles and policies of the country. They may be relied upon to do so in the future.

For example, the preservation of two or three hundred birds may seem—and is—of infinitesimal importance compared with the preservation of American freedoms, yet the Army has acted to preserve the last of our trumpeter swans, a remnant of which exists in Yellowstone National Park and the Red Rock Lake National Wildlife Refuge. An artillery range was planned at Henry Lake, on the flyway between these two areas. The birds almost certainly would have been destroyed by practice bombardment. The Army, however, chose an alternative and equally satisfactory site when the facts were pointed out.

To a country where such a viewpoint exists there can come nothing but victory. Nazis, Fascists and Japanese fanatics would never be able to understand this principle. And for this reason they are doomed to defeat.

Conservation Comment

The Foundations of Conservation Education has been published by a special committee on this subject appointed by the National Wildlife Federation. Dr. Henry Baldwin Ward is chairman of the committee and editor of this book, and his associates are Paul B. Sears and Cyril J. Ballam. This 242-page book is, in fact, a symposium in which Wesley C. Mitchell of Columbia University discusses "Conservation, Liberty and Economics"; W. C. Lowdermilk of the U. S. Soil Conservation Service considers "Conservation of Soil as a Natural Resource"; Paul B. Sears of Oberlin College presents "The ABC of Conservation"; Arthur Newton Pack, president of the American Nature Association, points out "The Pitfalls of Conservation"; W. W. Horner and Richard W. Horner, engineer and public relations specialists, respectively, discuss "The Role of Applied Science in Conservation and Its Relation to Wildlife". Finally, Dr. Ward himself presents a scholarly and stimulating analysis of "Biology as the Foundation of Conservation Education."

This is a book that defies detailed review within the confines of limited space. It would be unfair to the several collaborators to attempt a summary of their viewpoints in a few words. It is, therefore, necessary to consider this book generally for purposes of notice. This can best be done by saying that it is a valuable, pertinent and thought-provoking publication that should be read in its entirety. The reader should have pencil in hand for marginal notations, and should approach the first reading with the intention to reread and refine the ideas obtained.

Both conservation itself and the educational approaches to its teaching are variously defined today. In this book viewpoints vary to some degree, although there is unanimity of conviction that conservation teaching should be a part of American education. Toward that desirable goal, however, this symposium is an important contribution, worthy of the most careful consideration by leaders of education and all interested in conservation.

Copies are available from the National Wildlife Federation, 1212 Sixteenth Street, Washington, D. C., for sixty cents in paper binding; one dollar in buckram.

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That we have no reason for complacent assumption that all the problems of conservation are being solved is to be found in the results of a questionnaire sent to authorities of all forty-eight states by E. Sydney Stephens, chairman of the Missouri Conservation Commission. Forty-three replies were received. Mr. Stephens reported his findings to the International Association of Game, Fish and Conservation Commissioners. Among the reported weaknesses today are difficulties in securing the cooperation of landowners; appointive and regulative systems in the states that permit improper and unwise political influence; neglect of field research and educational programs, and insecurity in office of conservation personnel. Mr. Stephens found that out of 7820 conservation employees in the states replying, less than four per cent have technical training for their jobs. He discovered that twenty-one states have no scientific research provisions to solve game problems; fifteen have no educational programs; twenty-three states seek to educate adults and neglect the schools; nine states have no technically-trained employees at all.

Such information is valuable, reflects an encouraging capacity for self-analysis, and points the way for conservationists.

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A most practical bulletin that should make a valuable conservation contribution in the fields of forestry and soil conservation is *Forestry for 4-H Clubs*. This is a result of collaboration between Wilbur R. Mattoon and Erwin H. Shinn. Its title is descriptive and copies are available for ten cents from the Superintendent of Documents, Washington, D. C.

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Addition to the National Forests of 132,776 acres, to round out government ownership of these areas and facilitate management, has been approved by the National Forest Reservation Commission. Of this addition 112,383 acres of land in forty-four national forests have been acquired by purchase, the remainder by exchange. The largest increases in area were in the Ocala, Nantahala, and the Ouachita National Forests in Florida, North Carolina and Arkansas, respectively. The expenditure for these new areas amounted to $457,498.

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"It is fitting, of course, that wildlife should be subordinated to the defense needs of the Nation, but no emergency is great enough to warrant destruction of the fisheries or to cause irreparable damage to other wildlife on which the Nation's welfare depends," declares Dr. Ira N. Gabrielson in the annual report of the United States Fish and Wildlife Service.

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Our National Park system, set aside for posterity to preserve outstanding areas and to provide recreational facilities under proper control, represents one of our great common possessions. Testimony to the place that this system has in our national life is found in the record-breaking attendance of 21,050,426 visitors to these areas during the 1941 travel year.

PLANTINGS OF HOLLAND GRASS

These two-year-old growths of *Ammophila arenaria* have gone to work to catch the drift of the sand and hold it

Excitement, perils, and even death have beset the men who have sought the—

Soil Defenders from Overseas

Photographs from the Soil Conservation Service

By WELLINGTON BRINK

PLANT immigrants, too, find work and welcome in the New World.

Innumerable are the grasses, the legumes, the field crops, the trees and the shrubs—sons and daughters of Europe and the Orient, of Africa and South America, of Australia and the islands of the seven seas—that have added vigor, wealth and diversity to our farms and helped to shape our economic destiny.

Here in the United States, fabled melting pot of humanity where mingle many races, many tongues and many creeds, the crested wheat of Siberia greets the sweet clover of Persia.

Side by side, each a worthy charge of a foster nation, the persistent Bermuda grass of India and the industrious kudzu of Japan vie for the favor of the American farmer.

Adopted children of an acquisitive Yankee agriculture, the alfalfa of Greece and the crimson clover of France make common cause in behalf of democracy's great arsenal of food and fiber.

With the exception of tobacco and corn, all of our major and most of our minor field crops were introduced from overseas. By courtesy of able plants of foreign origin, we enjoy our breakfast orange juice, our apple pies, our pear preserves, our vinifera grapes, our Persian walnuts, our Japanese plums—yes, and wheat for our hot biscuits. The beauty of Old England caresses our latticed verandas, and the gentle greenery of Scandinavia cools our garden paths. Great bounty has come from afar.

It was in 1827 that John Quincy Adams instructed American consuls to collect rare plants and seeds for distribution at home. It was in 1934 that Charles R. Enlow and H. L. Westover traveled Russian Turkestan and Turkey in search of plants of special value for erosion control.

Between these two widely-spaced entries is an epic log of plant explorations that have added billions of dollars to Uncle Sam's income, made complete the riotous spectrum of his lapel bouquet, and contributed greatly to his state of health and joy of living.

Excitement, physical perils, disease and even death have beset the courageous men who have kept flowing a steady stream of promising plants to the promised land. These modern Jasons of pruning hook and clipping shears and field glasses have met their full share of drama and romance.

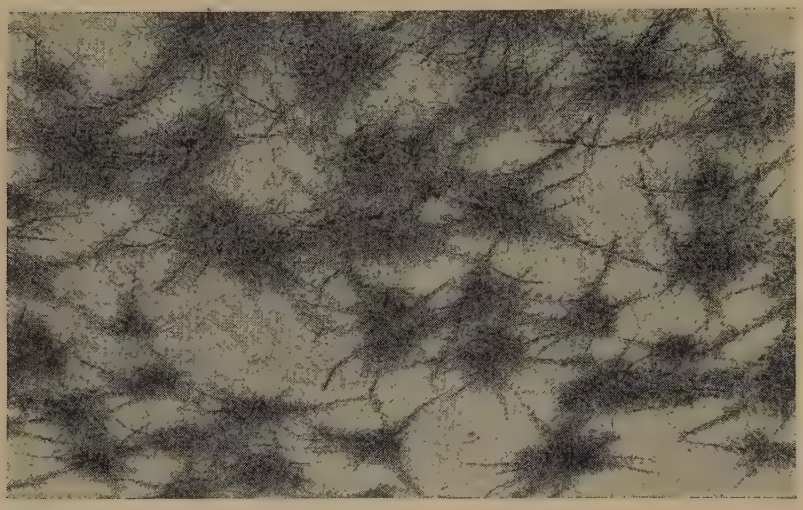
More than 100,000 shipments have been sent back home by plant-eager adventurers. Many of the plants shipped have become good Americans, subsequently rooting firmly in the kindly soil and favorable climate of the United States.

As various as the motives leading to discovery, are the purposes that plant immigrants now serve so well. A current and paramount purpose is the defense of the soil resource itself.

Patrick Henry reputedly said, 150 years ago: "Since the achievement of our independence, he is the greatest patriot who stops the most gullies." Many introduced plants,

PLANTING FARM LAND WITH FORESIGHT

This is an example of the practice of strip cropping, with alternate strips of alfalfa and brome grass mixed, which are to be left as permanent meadow strips on this Kansas farm



KIKUYU WORKING TO HOLD THE SOIL

The growth shown was accomplished in three months from transplanted runners. Growing low in areas with limited rain, it will attain a height of as much as three feet with moisture

SHOCKING A LESPEDEZA CROP FOR CURING

These are important legume plants, with a considerable membership in the family, and they have proved to be valuable immigrants when naturalized on the farms of America to aid soil enrichment

therefore, are very "patriotic." A gallant foreign legion is at the forefront in the stand against gully-washing, sheet erosion, depletion by wind, and soil exhaustion by exploitation. Kikuyu grass and the lespedezas certainly belong among the Kosciuskos and Lafayettes of soil conservation.

From far Uganda came kikuyu in 1915. Once dubiously but unnecessarily regarded by Californians as a plant likely to be difficult to control, kikuyu's very hardihood is now gaining citations in the Pacific Southwest. A strong, creeping, perennial grass, it forms a dense turf, with branching leafy stems. Its leaves are flat and spreading. In areas of limited rainfall, it makes little top growth, although it sends out shoots and spreads along the ground, establishing itself firmly. In the presence of moisture, however, it has been known to grow as high as two and one-half to three feet. It does well under moist conditions, and responds vigorously to good soils. It has not been known to seed in California. It can be established only by roots or runners, and so is easily confined to areas where it is most useful. It is aggressive; makes things tough for weed invaders. It has successfully withstood temperatures as low as 23 degrees Fahrenheit.

Kikuyu is essentially a pasture grass. As a forage crop, it is as palatable and nutritious as Bermuda. Kikuyu is proving its prowess as a soil binder for dam embankments, eroding slopes and gullies. It is developing excellent grassed waterways, some of them on very steep slopes. Visitors from Australia, New Zealand and South Africa express surprise that America has been so long in recognizing its value.

In the northern Great Plains crested wheatgrass ranks far ahead of the native grasses in many important particulars. It leads the field in versatility. More than 500,000 acres have been put into crested wheatgrass in the last five years by the Soil Conservation Service alone; many thousand more acres have been established by farmers, stockmen and by other federal agencies. Introduction was effected 42 years ago, but it was only after some four decades of experimentation that the grass was put to practical use. Crested wheatgrass began proving its qualities as a forage plant at about

the time that 25,000,000 acres of former wheat and feed crop lands were abandoned because of drought and the economic upheaval. Here its efficient root system at once began to pin down drifting soils. It resisted stem rust and ergot. It permitted as many as 2000 ewes to feed on a 320-acre field in Montana. Twenty years ago you would have had to pay a dollar and a half for a pound of crested wheat seed that today can be purchased for as little as twelve cents. This is a fair indication of how the market has been affected by mass production for soil-defense needs.

The introduction of Sudan grass alone has paid many times over for all the expense attached to plant exploration work. Sudan is grown in every state, but is particularly important in the semi-arid regions on both dry and irrigated farms. It efficiently anchors the soils against western winds. The grass was produced, literally on prescription, in 1909, having been sent to the United States in response to an urgent request by the late C. V. Piper of the Bureau of Plant Industry, who deduced that there should be somewhere in Africa a plant comparable with Johnson grass but lacking the latter's vicious rootstock.

The importance of close-growing crops to conservation and to the farm economy is becoming axiomatic—such crops as sorghums (so important as barricades against wind erosion), wheat, barley, oats, and rye.

In the "distinguished service" category are brome grass from Russia, orchard grass from Algeria, meadow fescue from Turkey, red top from Europe, dallis grass from the Argentine, bluegrass from sunny Italy, timothy from Europe, carpet grass from the West Indies, Canadian bluegrass—strangely—from Syria, Rhodes grass from Africa, para grass from South America, Napier or elephant grass from Africa, rye grasses from Europe, and bent grass from southern Europe and New Zealand. These are but a few of the shock troops in the "free forces" engaged in the literal defense of the American soil.

But if I were picking a scrappy fighter against erosion on which to pin a particularly shiny medal, I would take the tenacious groundling that is called couch grass by Australians. In California, which was long suspicious of its

NAPIER GRASS COMES FROM AFRICA

It belongs in the distinguished service category. It is also known as elephant grass, as the growth here well suggests. This planting in a Soil Conservation Service nursery in California is startling

KUDZU TAKES OVER A ROADSIDE DITCH

Erosion is now completely under control and the ditch is filling with silt. This plant has been known to race across a field or down a gully at a speed of fifty feet in six months

LESPEDEZA SERICEA CAPTURES A BANK

This is a graphic example of the value of this legume in both checking the erosion of a raw cut for highway purposes and in covering up the roadside scar. Plant immigrants serve as roadside improvers

CRESTED WHEATGRASS

Introduced forty-two years ago, it was given four decades of experiment before it was put to practical use, and is now proving a boon

aggressiveness, the name is devil grass. Virginia farmers, recognizing its tenacity, dubbed it wire grass. In other places it is variously known as dogtooth grass, Bahama grass or Scotch grass. But throughout Arkansas, Louisiana, Texas and Oklahoma the designation is Bermuda.

All the discipline needed to keep Bermuda grass in its proper place is a plow. And all the incentive required for an amazing performance is an extensive soil repair job.

Back in Texas I used to associate *Cynodon dactylon*, for that is its scientific name, with the battle hum of a lawnmower long before I thought of it in terms of terrace outlets and diversion ditches and gully banks. There it is the sun-defying substitute for the bluegrass of the East and North, giving a soft velvet blanket to well-groomed yards and parkways. Its sterner uses, however, have long been recognized by such pioneers as Harry Kelly, who now has 2000 acres of Bermuda on his farm near Fort Smith, Arkansas, and F. A. Mitchell, the so-called "Bermuda king" of Oklahoma. Since the beginning of widespread hostilities on erosion, Bermuda has spread by the hundreds of thousands of acres. I have seen it at work in Texas and Arkansas, in Alabama and Georgia, in Maryland and Kansas.

A perennial introduced from the warmer regions of the Old World, Bermuda produces underground rootstocks and creeping stems that root at the nodes, make a very dense sod and become a grass of outstanding value for erosion control. Not only does it bind the soil and constitute an effective barricade against rushing waters, it also improves the farmer's fields and makes good pastures. As a sideline, it serves as an excellent desilting agent.

Precisely as with other forms of combat, the successful defense of the soil requires coordination of several forces: Grasses to check erosion advances and to consolidate a position; legumes to harness critical slopes, to cooperate in rotation stratagems, and to rebuild and enrich the land by improving physical condition and adding nitrogen. Grass-legume mixtures are needed to do a still better job than either grasses or legumes can accomplish singly. Cereals and other crops provide ecological and economic values. Trees and shrubs protect denuded heights, stabilize areas hopelessly lost to cultivation, and afford attractive and profitable refuges for wildlife.

The war fronts are different in 1942 from those in 1917. The American farmer, by and large, is this time unwilling to lose the war at his own back door under pressure to win a war across the seas. This year he is determined to win the food war and at the same time keep his soil. And the highway along which he moves his produce to market is lined on either side by green bannered forces from abroad eager to help him.

Many are the legumes, trailing on their roots miniature nitrogen factories that have been brought in from Europe, from Asia Minor, from Scandinavia, to do valiant reconstruction jobs far from their native habitats. Numerous are the bulletins, the books and the magazine articles that have been written about lespedezas, alfalfa, cowpeas, field peas, soy beans, and the clovers—sweet, red, white, crimson and alsike.

Clovers are of foremost rank among legumes used to conserve soil. From them come soil-building green manure, nutritious hay, fine pastures and soil-protecting cover crops. Red clover excels even alfalfa as the most widely-used leguminous crop plant in the United States.

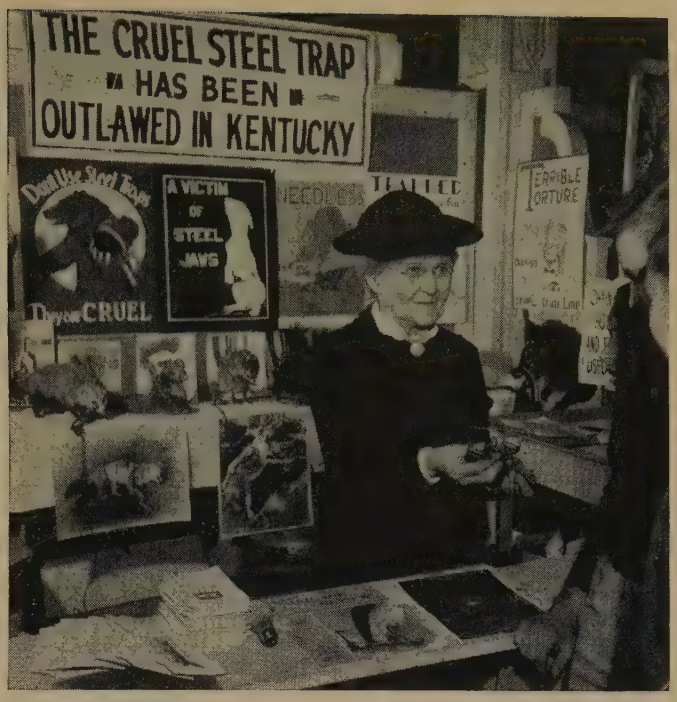
In addition to their agronomic uses, clovers are also valuable for wildlife. More kinds of wildlife feed on the seeds and succulent leaves of clovers than on any other group of legumes. Red clover is eaten by twenty-two different animals; white clover by twenty-eight. All the clovers together are eaten by more than one hundred birds and mammals. Clovers hold preferential standings on the menus of the bobwhite, the cottontail rabbit, the California quail and the prairie sharp-tailed grouse. (Continued on page 108)

Miss Lucy Furman, who wars against the steel trap in Kentucky is—

Ninety Pounds of Fight

By TOM WALLACE

Photograph courtesy of The Louisville Times



MISS LUCY FURMAN
Here she is photographed in an Anti-steel-trap League exhibit set up to further her remarkable campaign for a law in Kentucky, now in danger of repeal

BECAUSE of politics Kentucky's anti-steel-trap law, passed nearly four years ago, hangs in the balance. The Legislature meets in January. Between the law, which has not been fully enforced, and repeal, sought by conservatives who want to continue using steel traps, stands Lucy Furman. She weighs, maybe, ninety pounds, but is as full of fight—her kind of fight—as anybody in the Cumberland Mountains.

Kentuckians are wondering whether Miss Furman will win again—or keep won—the victory she gained when the law forbidding use of steel traps was passed.

Miss Furman was born in Henderson, an Ohio River city in western Kentucky named for Colonel Richard Henderson. Colonel Henderson was head of the Transylvania Company, which set up a short-lived proprietary republic in part of what now is Kentucky, after buying 20,000,000 acres of land from Cherokee Indians, when the area was part of Virginia. Henderson was for a time the home of Audubon, and now boasts a state park bearing the naturalist's name.

Miss Furman was educated at fashionable Sayre Institute, Lexington, and took a literature course at the University of Cincinnati. Early in life she began writing fiction. Soon after publishing *Stories of A Sanctified Town,* in 1897, she became a teacher in Hindman Settlement School, in the Kentucky Mountains. There she wrote *Mothering On Perilous, The Quare Women, The Lonesome Road* and other novels. These established her as an interpreter of mountain life. She became interested in conservation of wildlife when in contact with mountain trappers.

Miss Furman does not have robust health. She is small, lightly-built, soft-spoken. But fire burns in her eyes when she talks of unfortunate animals tortured by traps, and thoughtless women who encourage the trapped-furs trade. But she does not storm the citadel of law-makers. She relies on gentle persistency and a thorough knowledge of her subject. She has command of her time because her books still sell—although the new generation of book reviewers may not know of their existence, or Miss Furman's—and are required reading in Kentucky high schools.

Miss Furman left the rugged life of the Kentucky hills, to live in Florida. Physicians advised it. In the mountains she left the residence in which she expected, when she built it, to spend her years of retirement. Her physicians said her heart wouldn't stand climbing to the eminence she chose for the site of her cabin "ringed by the azure world."

In Florida, in 1928, she wrote an article, published by *The Atlantic Monthly*, on cruelty of trapping. The late Commander Edward Breck, who had founded the Anti-Steel-Trap League three years before, read the article and made its author Vice-president of the League.

In 1933 Vernon Bailey, chief naturalist of the United States Biological Survey, invented the humane leg-hold animal trap, not for profit, but in behalf of animals caught —at the rate of many millions every year—in traps that caused many of them to gnaw off the leg between the vice-like jaws of the steel trap and brought slow death in the trap to others. Foxes caught in steel traps sometimes die of burst ventricles of the heart, so great is their fear and suffering.

The less nervous animals manage to chew the flesh of the trapped leg, sometimes tearing the flesh from the bone and breaking the bone, leaving a paw in the trap when they hobble off, to die of starvation because they no longer have the physical equipment they must have to find their food. Not until the leg-hold trap was invented, and made available to manufacturers by the inventor, was there hope of outlawing the steel trap.

There seemed to be little ground for hope that it would be outlawed in Kentucky when Miss Furman came to

Frankfort and set up headquarters there. In 1934 her bill was beaten. She then began the work of an evangelist. By 1936 the Kentucky Federation of Women's Clubs and many other organizations were her supporters.

She had only to call upon daily newspapers for editorial support and news column space, because all of them knew and valued her.

Foxhunters were her champions because steel traps catch and mutilate many fox hounds that have considerable money value and the deep affections of owners.

The bill failed in 1936.

In 1938 the Animal Trap Company of America, which had been the world's largest maker of steel traps, began making leg-hold traps as a result of intervention of R. E. Hinman, of the Belknap Hardware and Manufacturing Company, of Louisville. Mr. Hinman was a Nature lover and Miss Furman took her story of the new trap and the tortured animals to him, after 1936.

In 1938 Miss Furman, who had been known at two earlier sessions as the trap woman, got her bill passed, to take effect in 1940.

Other traps designed to take furbearers without torture are now in the market. Several of them, for the smaller animals, have won annual prizes offered by the American Humane Association. An argument in behalf of such traps is that pelts are not injured by animals gnawing off legs, and that annual production of furbearers is not diminished by starvation of injured animals that escape, three-legged, from steel traps. But trappers are ruralists. Ruralists do not like change under statutory compulsion. So, Miss Furman now is on guard at Frankfort to prevent, if possible, repeal of the anti-steel-trap law.

If this stalwart crusader is able to keep the Kentucky Legislature under her influence until the trappers become used to the new-style traps nothing, presumably, would ever repeal her law.

Miss Furman accomplished, between 1934 and 1938, a task that seemed at first impossible of accomplishment.

Moneyless people as lobbyists for moneyless enterprises —people who have nothing to barter in the trades of politicians—are at a disadvantage at sessions of legislatures, and Lucy Furman pleads only a cause.

When, single-handed, she began asking law-makers to consider the situation of wild furbearers—"varmints" to ninety-nine of one hundred Kentucky legislators—her project seemed, to most observers, a more hopeless one than the education of Huckleberry Finn.

Will she now be able to persuade the legislature not to repeal her law when steel trap users, fearing its better enforcement, and utterly unconcerned about humaneness to wild animals, exert pressure?

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Octopus Palm

By CHRISTINE EMERY

EVEN IN semi-tropical Florida, well grown specimens of *Phoenix reclinata,* or "octopus palm", as it is more commonly called, are unusual sights for local residents as well as tourists. The palm shown in this picture was brought from one of the Caribbean islands about fifty years ago by a sailor. Returning to his home in West Palm Beach, he planted the pencil-sized offshoot in his back yard and in the course of time, because it is a slow grower, the palm took possession of his property.

Just when the owner was deliberating whether to trim back the palm or pull down part of the house, the government acquired the ground for a new post-office site and it was imperative that both the palm and the house be disposed of. Donated to the city, after a difficult transplanting operation, the palm was given ample spreading space in an evergreen parkway overlooking beautiful Lake Worth. Thoroughly at home, it looks as though it always grew there, and, because it is so decidedly different from the bordering royal, date and coconut palms, it attracts immediate attention.

In their natural habitat, palms of this type are said to attain great age and enormous size. This comparatively young plant is making a most satisfactory showing, for it now has a range of more than forty feet of lawn coverage. The new shoots, or central stalks, grow up much like plumy-topped asparagus, and, reaching a height of twenty feet, fall down and turn back for the preliminary upward growth that precedes each new drop or extension. Many small cuttings that are really rooted growths have been taken from this rare plant. It will be many years, however, before they live up to their distinctive tradition by spreading out and growing so luxuriantly that the upright ends of the long fingers, or feelers, need to be supported, and are encouraged increasingly to emphasize their inherent traveling tendencies, which are best described as "an octopus-like invasion!" This is plain in the picture.

When the seed catalogs start coming it is time to take stock of—

What's New in the Garden

By ANDREW S. WING

Garden Editor of Nature Magazine

LADIES and gentlemen! Please give me your undivided attention. The great floral and plant show of 1942 is about to begin! All the novelties! The most astounding exhibition of horticultural stars the world has ever seen! Step closer, please!

And so with the usual fanfare and flourish of publicity the plant novelties of 1942 are ushered in. Are they up to the standards for former peace-time years? Will there be sufficient stocks of vegetable and other seeds to go around? Or must gardeners feel the pinch of war-time economy?

It is a pleasure to note that there will be no dearth of good things to plant. The old standard sorts will be available—except in a few instances—in sufficient quantities for all. And the débutantes of the flower, fruit and vegetable world are as charming and numerous as in normal times.

Starting with flowers, we find just as many annuals of outstanding merit as in previous years. Perhaps the average is even higher. We have become accustomed to expect great things from the hybridists working with such popular families as zinnias, marigolds, phlox and petunias. This year we are not to be disappointed. The average in the All-America trials runs higher, according to the judges, than any year since 1934. These flowers have been tested in sixteen climatic sections of the United States and southern Canada, leaving no doubt as to their merit. But with flowers, the final judgment is a matter of individual taste, and since it is impossible in a short article to describe all of the novelties, we shall take a peek at a few that have happened to appeal to the writer.

ALL-AMERICA SILVER MEDALIST

This is Pearly Gates, a large white morning glory that is a companion to Heavenly Blue. Photograph courtesy of Peter Henderson

Pearly Gates morning glory heads the list in the All-America selections, a silver medalist, there being no gold medal award this year. It is well described as "an exquisite large white companion for the early Heavenly Blue, considered the finest of all morning glories." Anyone who likes morning glories will like Pearly Gates as a running mate for Heavenly Blue and the sensational Scarlett O'Hara. It grows rapidly and will flourish wherever morning glories grow.

Pink Queen cleome, or spider plant, is a real improvement over the old sorts, which are inclined to become leggy. This is a vigorous, free-flowering, pest-free plant that is never out of bloom from June until frost; a handsome plant well worth a trial.

Yellow Flare cosmos is similar to Orange Flare of 1935, but yellower. A fine variety of its type, although I prefer to get my yellows and oranges from other families

THIS PHLOX WINS HONORABLE MENTION

It is Red Glory, a rich red with a contrasting white eye that is distinct and lovely. Photograph courtesy of Peter Henderson

and like the usual range of cosmos colors very much better.

Purple Robe nierembergia is a little beauty, worthy of its name. It is a true dwarf, perfect for an edging, low border, or rockery plant. The deep blue color is rich. It seems to stand drought and is not fussy as to soil or location, although it prefers full sun and a sandy loam. This is a bronze medalist.

Marigolds come next, headed by Butterball, a dwarf French double of the Harmony type. It is a golden yellow and will probably replace Golden Harmony. It grows twelve to fifteen inches high and is compact and bushy, uniform in height, form and color, early and a long, steady bloomer. Good for cutting and makes a fine potted plant.

Golden Bedder is said to be the earliest of all marigolds to bloom. The plants, when not crowded, form symmetrical mounds covered with golden-orange chrysanthemum-like flowers. Plants grow to thirty inches and stems are long enough for cutting. Its chief value is its earliness, making it possible to pull it out when it matures and replant with something else.

Red Glory wins honorable mention in the giant annual phlox group. It is a bright, rich red with a contrasting white eye, distinct and beautiful. A tall, uniform plant, and free-flowering.

Royal Purple zinnia has a strong, rich shade that will appeal to those who like solid colors. It grows tall and has dahlia-size flowers. The color was described by one girl as "like royal velvet".

Starlight is the name of a new annual rudbeckia or coneflower that comes in brighter colors than the older sorts, running from primrose yellow to mahogany with mahogany centers; mostly bicolors. Some are singles but most of them are doubles. Anyone who likes these sturdy old favorites will cordially welcome this 1942 introduction.

THE ONLY ALL-AMERICA ROSE FOR 1942

This is Heart's Desire, a pure, even shade of luminous red, sunproof, free-blooming and fragrant, with superb bud formation

AN EVER-BLOOMING PILLAR ROSE

This is the culmination of a life-long dream of Dr. L. H. Nicolas and is named for him. Photograph courtesy of Jackson and Perkins

This about completes the list of All-America flower stars, but a glimpse through the catalogs will bring to attention any number of other introductions of 1942 and recent years that are worthy of a trial.

Since 1942 is destined to be vegetable year because of the emphasis put on nutrition in the Defense Garden Program, suppose we take a look at the kitchen garden novelties next.

Decatur pole bean tops the vegetable list, winning the only silver award in two years. This means that it is good. It has to be to win over so many good existing bean varieties. Quality, disease resistance, and productivity raise this vigorous string bean up above the average. The beans are white when mature. It seems to be a winner.

Medal Refugee is a new snap bush bean, stringless, good quality and fine for shelling because it is the first white-seeded Refugee bean. Recommended for both home and canning use, it gets a bronze medal.

Lincoln is the name of the new hybrid sweet corn originated by Dr. Ralph Singleton of the Connecticut Experiment Station. Lincoln is hailed as a great mid-season variety. Tall, large-eared and of superb quality, it yields heavily of 8-inch ears that are well filled, tapered and a bright yellow color. Matures in 85 days from planting. We haven't tried this yet, but if it is as good to eat as Golden Bantam we will switch over.

Honorable mentions in vegetables go to the following All-America entries:

Two new varieties of lettuce: Cosberg 600, a combina-

ADMIRING A NAMESAKE
David Burpee studies the blooms of the giant chrysanthemum-flowered zinnia named in his honor. Photograph courtesy of Burpee

tion of Cos and Iceberg, similar to the original Cosberg but an earlier grower. It is a sure header and is useful for both home and market use.

New York PW55 is the other, an early New York type, compact, medium size, with a small core. The earliest crisp-leafed lettuce, it should have a wide range of adaptability for both home use and the market.

Fordhook Zuccini squash is a long, streamlined bush squash of excellent quality. It grows to large size but is best used when about a foot long and two inches thick. A heavy yielder, its bush form makes it well adapted to home gardens.

There are several other new vegetables of merit for your Victory, or Vitamin, Garden. One of these is a new okra, which should extend the popularity of this interesting vegetable. It is named Louisiana Green Velvet and is said to be smooth, velvety and tender. Good for home and market.

For a really new idea in edibles try Burpee's Celtuce. It looks like a lettuce that has grown too tall, and the stems when peeled are tender and juicy with a flavor somewhat resembling celery. It may be eaten raw with salt like celery, in salads, or cooked. The cooked dish has something the texture of summer squash but with a distinctive flavor.

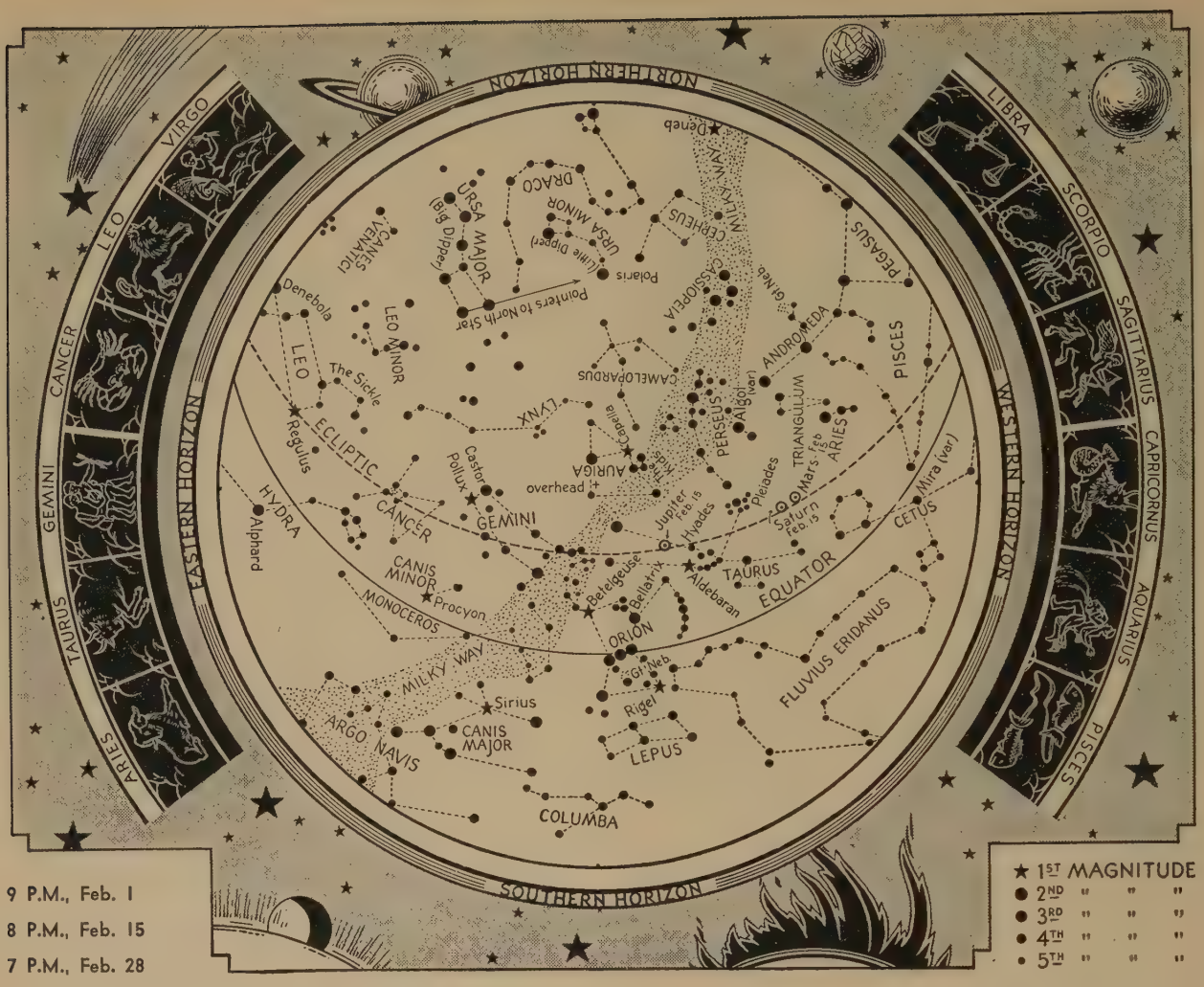
There is only one All-America rose selection for 1942 but there are other new roses of merit. The winner is Heart's Desire, a pure, even shade of luminous red; sunproof, even in the hottest weather, vigorous, free-blooming, fragrant and with a superb bud form. Freedom from disease, combined with hardiness with slight protection, make it a rose deserving the attention that it will no doubt receive. But if you think that there is a dearth of good new roses you are mistaken. The rose catalogs are crowded with aspiring newcomers.

Hardy asters and chrysanthemums again hold the spotlight among the fall-blooming flowers that winter through. Survivor is the apt name for a 1942 aster in the Novae Angliae group, a fine pink with long-lasting flowers of large size. For chrysanthemums better take a look at the catalogs yourself, as there is no impartial board to choose between the outstanding introductions in this handsome group of flowers. New colors are being introduced every year in the so-called cushion type of mums to satisfy the ever-growing demand for these useful early bloomers.

When it comes to perennials there is plenty of promising material from which to choose. In the field of irises and peonies alone it takes a specialist to keep up with the new introductions of note. These new varieties of distinguished origin commonly sell at fancy prices the first year, so most gardeners choose to look them over carefully for a season or two, until supply catches up with demand and the price drops to reasonable levels. Any of the leading catalogs will give you a line on what is worth while.

Gladioli and dahlias, too, are bobbing up every season with a bevy of bulbous beauties—bigger, brighter and more striking than their predecessors. At the same time it is satisfying to note a reverse trend towards smaller, daintier and fragrant glads to offset the overemphasis on size. The dwarf and single dahlias, of which the latter commonly bloom the same year from seed, serve to form a pleasing contrast to the giants of their respective races. If you have not tried these newer forms of glads and dahlias by all means do so, or (Continued on page 103)

A REAL IMPROVEMENT AMONG SPIDER PLANTS
This cleome is known as Pink Queen and is vigorous, free-flowering and pest-free. Photograph courtesy of Peter Henderson



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

How Distant is the Sun?

By ISABEL M. LEWIS

As the earth in its journey around the sun travels in an ellipse and not a circle its distance from the sun is constantly changing. When it is at a point in its orbit closest to the sun, called perihelion—where it will be found early in January each year—it is at a distance of approximately 91,400,000 miles from the sun. Six months later, in the first week in July, the earth is in aphelion, the point in its orbit farthest from the sun. Its approximate distance from the sun is then 94,500,000 miles. There is, then, a difference of more than 3,000,000 miles in the least and greatest distance of the earth from the sun in the period of one revolution of the earth around the sun each year. Now midway between the greatest and least distance of the earth from the sun we have what is called the mean distance of the earth from the sun. This is what is meant when we speak of the distance of the earth from the sun. To determine accurately the mean distance of the earth from the sun is one of the most important of all astronomical problems. This mean distance is the *astronomical unit,* the celestial measuring rod that the astronomer uses in determining the scale in miles of the solar system and of the universe beyond.

To find the distance of the earth from the sun the astronomer uses the same method as the surveyor when he wants to find the distance of an inaccessible point on the earth's surface—the method of triangulation. There must be a base-line accurately measured. The surveyor chooses a line on the earth's surface the length of which is known. Then, from the extremities of this base-line, he measures with a theodolite angles in the triangle that is formed by the base-line and lines connecting its extremities with the inaccessible point. From the data then at hand he can solve this triangle and find the distance in miles.

To solve his problem of finding the distance of the earth from the sun the astronomer also needs a base-line accurately determined. This he has in the equatorial radius

of the earth, which is known to be 3963.34 miles in length. This value is believed to be correct within less than a tenth of a mile, and is based upon measurements of arcs of meridians on the earth's surface by the same triangulation method. The error in the distance of the earth from the sun that would be brought about by an error of one-tenth of a mile in the earth's radius is about 2500 miles, so it is evident how important it is to know this base-line.

Far more difficult to measure accurately because of its small size is the small angle at the sun which is subtended by the earth's radius. This is that very important angle known as the solar parallax, which is essential to the solution of this problem. It is in the determination of this angle that the astronomer's troubles begin. So small is it that every care must be taken to avoid all errors of observations and instruments. There are a number of indirect methods of obtaining it and one of the best is furnished by small asteroids that come close to the earth.

In the winter of 1930-31 the famous little asteroid Eros, which was discovered in 1898 and which is the most valuable of all objects for this purpose, was due to come within about 16,000,000 miles of the earth. Elaborate plans were made for a campaign of observation of this asteroid over the period of five or six months that it would be near the earth. Most of the leading observatories of the world took part in the program of observations. Long series of observations made during this period with more than sixty instruments were reduced and the work of reduction took ten years. The Herculean task was completed only a few months ago. The comparison and discussion of the results of the observations were placed in the hands of the Astronomer Royal of England, Dr. H. Spencer Jones, who was especially well qualified for the task.

The announcement of the results of the new determination of the value of the solar parallax, and so indirectly of the latest revised value of the distance of the earth from the sun, was made by the Astronomer Royal at a meeting of the Royal Astronomical Society in June of last year. The values that were obtained were all in remarkably close agreement, but surprisingly they put the sun more than 100,000 miles farther away than the value that has been adopted for a number of years, which corresponds to a distance of 92,897,000 miles. The new determination of the solar parallax, now believed to be the most reliable, gives for the mean distance of the sun from the earth 93,003,000 miles and the uncertainty of this result is estimated to be not over 15,000 miles either way. There is, of course, also an additional uncertainty that exists of about 2500 miles, which arises from the fact that the radius of the earth expressed in miles may be in error by as much as a tenth of a mile. The old value for the solar parallax is 8.80 seconds of arc, the new value is 8.79. The change of one hundredth of a second in this small angle makes a difference of 106,000 miles in the mean distance of the earth from the sun. In round numbers, the new value of the solar parallax gives 93,000,000 miles for the distance of the earth from the sun, as compared with 92,900,000 miles from the parallax that has been used for some time.

One may ask what would be the effect of a change of 100,000 miles in the astronomical unit in terms of which all celestial distances are expressed? Not only the scale of the solar system and the universe beyond but the diameters and masses of the celestial bodies are involved in the value of this astronomical unit. An increase of 100,000 miles in the mean distance of the earth from the sun means an expansion in the size of the solar system and the universe, slight, to be sure, but still appreciable. The diameter of the orbit of the outermost planet, Pluto, would be increased about 8,000,000 miles over its formerly estimated value. The light year, which is equal to about 63,310 astronomical units, would be increased by about 6,000,000,000 miles and the stars would be farther away than we thought.

Angular measurements of the diameters of the sun, moon, and planets when converted into miles are dependent upon the value of the astronomical unit. An increase of 100,000 miles in this unit amounts to .11 per cent of its value. So the linear measure of any quantity that depends directly upon it must be increased in the same proportion. Therefore the diameter of the sun, which is given as 864,400 miles in round numbers, on the old scale, would be increased nearly 1000 miles on the new.

Although this latest determination of the value of the angle of the solar parallax, and the value of the distance of the earth from the sun which depends upon it, is probably the best determination that has been made of this very important astronomical quantity up to the present time, it is not considered final. It is probable that no change will be made in value of the parallax that has been in use now for many years, namely 8.80 seconds of arc corresponding to 92,897,000 miles, or in round numbers 92,900,000 miles, until the new results have been very carefully checked by some other of the known methods that may be used. It is interesting to recall that the value of 8.80 seconds for the solar parallax was determined also from observations made of Eros in 1901, a much less favorable time when the asteroid at its nearest approach was nearly 30,000,000 miles from the earth. Comparison of the two sets of materials have shown, according to Dr. Jones, that the later set has 25 times the weight of the earlier one. It is also interesting to note that if the new value of 8.79 were adopted for the parallax and 93,000,000 for the mean distance of the earth from the sun it would be restoring the value adopted about 1880.

The planet Venus comes into conjunction with the sun on February 2, when it will pass to the morning sky. It will be too close to the sun until later in the month when it may be seen low in the east before sunrise. Mercury will be in conjunction with the sun on February 9, and will be too close to the sun to be seen until the end of the month, when it may be seen low in the eastern morning twilight.

Jupiter is in Taurus this month, a few degrees northeast of Aldebaran in the evening sky. Saturn is on the boundary between the constellations of Taurus and Aries this month, a little to the southwest of the Pleiades and west of the Hyades. It will be in quadrature with the sun, and due south at sunset on February 11. Mars is now decreasing in brightness, passing from Aries into Taurus.

THE SCHOOL PAGE ★★★

EDITED BY DR. E. LAURENCE PALMER

Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

Vegetables in School

With the advent of war, a new interest in what we eat is assured. In the last World War, the whole philosophy of agriculture was to raise great volume. At present the emphasis is on quality, since if one type of food has twice the food value of another of the same bulk one half the space occupied by the poorer food can be used in a ship's hold for the carrying of other foods or for the carrying of munitions. So varied are the problems associated with the improvement of quality of foodstuffs that they cannot be discussed adequately here. It is recommended that teachers, however, write to their state agricultural college or agricultural experiment station for suggestions appropriate to their part of the country.

There is every evidence that this summer we will be raising vegetables of all sorts wherever we can, and that children will be recruited to help in solving the farm labor problem. As this is written, a movement has been started in the State of New York to use young women from the cities on our farms to help in some of the ways possible to women.

Schools can begin, with this copy of *Nature Magazine*, to do many things in preparation for the growing of crops this spring. The special insert in this number provides detailed suggestions for growing eighteen kinds of food plants, most of which, especially in processed form, may be shipped long distances for food purposes. Its use should be patriotic in every sense. There are a few things of a general nature that may be done in schools and which were not adequately presented in the insert.

As emphasized in the first paragraph of this article, quality is of higher importance than quantity in almost anything that has to do with foodstuffs. This is particularly true of the most highly-priced thing a farmer or a gardener buys—his seeds. A bushel of seeds with a low percentage of germination may be less valuable than a half pint of seeds with high germination qualities. It is probable that with the advent of spring many people will go through their cupboard drawers and get out the packages of seeds that were left over from last year, or the year before. They may then plan their new year's purchases to fill in the gaps not already supplied by the seeds on hand. Such a course may be quite idiotic because the seeds already on hand may be no good whatever.

A simple testing practice suitable for schools calls for the following procedures. Soak two pieces of blotting paper in water. Count out one hundred seeds from a lot you may consider using in the garden this year and place them on one of the pieces of wet blotting paper. Place the second piece of wet blotting paper on top of the seeds to make a sort of "seed sandwich." Make similar "sandwiches" containing a hundred seeds of the lots you consider using. Keep a record of each "sandwich" and lot. Put your "sandwiches" into a bundle and set them in a shallow dish of water so that they will continue to remain wet but not wholly submerged in the water. Put the material away for a few days and then open the paired blotters to see how many of the hundred seeds have germinated. If, on the first examination, few seem to have germinated, it may be best to let them stand a day or so longer. Eventually, however, it will be evident that a certain percentage of the seeds definitely will not germinate. Since you used a hundred seeds to start with, the number of seeds germinating will represent the percentage of germination of the sample. If you wish to use fewer or more for the sake of the arithmetic problems involved, this may be done easily.

The percentage of germination thus determined should be written on the appropriate packets from which the samples were taken. If the percentage is low, it will probably be best not to try to grow the seeds at all, but if it is high it is probably reasonably safe to use seeds that may have been purchased in other years. If for some reason it is necessary that seeds with a low germination record be planted, the amount planted should be proportionately more than that called for either on the packet or in the chart section of this number of *Nature Magazine*.

A patriotic thing for the children of a neighborhood to do might be to offer to test the seeds of those who will plant gardens, making reports on the findings. While it might not prove popular with the merchants, it would be interesting for the children to purchase packets of seeds from different stores, make the germination tests on a few kinds and then, by the results, to decide whether other seeds should be purchased from the same source. Whether or not the findings should be given publicity at all will, of course, vary with the circumstances, but if publicity is to be given, enough tests should be made to insure correct results rather than snap conclusions based on too few data. Such a situation lends itself perfectly to the development of the essentials of the scientific method.

An excellent bulletin on seed testing is published by the United States Department of Agriculture. It is called "Testing Seeds in the Home and Rural School". It contains simple procedures for testing the germination of seeds, pictures of simple weighing machines that are useful in studying seeds, and illustrations of the common weed-seed impurities, some of which should never be introduced into clean garden lands. This bulletin should be in all schools this year at a time when there will be so much emphasis on the raising of foods to meet the emergency.

Gardens should be planned before the beginning of actual planting and much help in this can be had from sources in school. Most states have published excellent material for use by their 4H Clubs, and some of this may be available to the school teacher who applies to the state's agricultural college.

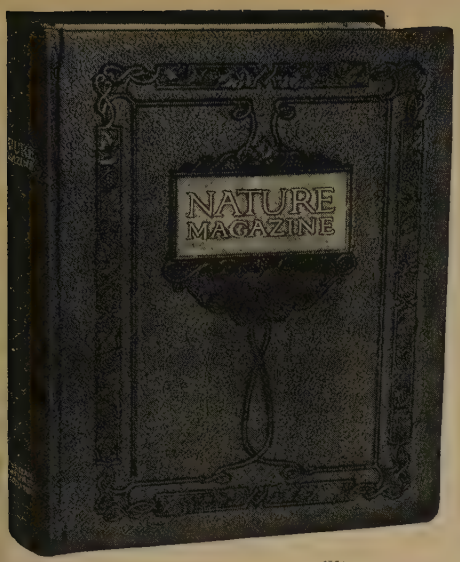
Gardens should be planned not only to suit the eye and to provide convenience of cultivation, but with consideration of soil and moisture differences. Then, too, certain plants should not be planted near certain other closely related plants if there is danger of pollen from one being transferred to the pistils of the other. Pop-corn and sweet corn, for example, should not be planted near each other. The cucurbits, such as squashes, pumpkins, melons and cucumbers, may suffer if the different kinds are planted closely together. Another consideration centers around the fungus and insect pests that prey on closely-related plants. Many of the plants growing in a flower garden are closely related to those growing in a vegetable garden. Because of this, the flower garden plants may serve as a sanctuary for creatures that feed on those plants we wish for food.

In planning the garden, it should be recognized that some plants mature slowly and others quickly. Because of this, quick-maturing plants may often be planted close to the slowly-growing kinds and may reach the time of harvest before they interfere with the slow-growers.

The insert on pages 81 to 88 of this magazine should provide any teacher with enough material to get a good start on a school garden, an activity that may help considerably in solving the food problem associated with the present emergency. Letters addressed to the author at Cornell University, Ithaca, New York, will bring answers to other questions that may arise from the experiences of teachers. For the most part, these answers will have to be reference to local material of which the teacher may not be aware but which is too varied for advantageous listing on this page. As one 10-year-old correspondent wrote the editor of this page the day after Pearl Harbor—"Thumbs up. They'll allway be a USA".

Study Material

In our October issue we carried a note indicating the need for Nature Study material for use in the New York City schools. As a result of this, according to a report from Harvey Wilde, president of the New York Chapter of the American Nature Study Society, many members of the American Nature Association and readers of *Nature Magazine* responded, from many parts of the United States. As a result of this interest Miss Alice Wilson of Madelia, Minnesota, has been appointed chairman of a committee to promote the collection of Nature Study material for New York City children. Individuals interested in making such contributions may get in touch with her. It is suggested that they write Miss Wilson a letter describing the collected material. Those wishing to send collections direct may do so, addressing Mrs. Mary L. Reed, P. S. 147, 293 East Broadway, New York City. It is asked that contributions be identified and labelled by the senders. Collections that may be made by Boy Scouts, Girl Scouts, Campfire Girls, 4-H Clubs and similar organizations should be gathered under proper supervision so that rare flowers and the like are not gathered through ignorance. The Nature Study Society slogans for the New York Schools are "Nature Rooms or Corners for Every School" and "Nature Study Material for Every Teacher."



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WHAT'S NEW IN THE GARDEN

(Continued from page 99)

at least look them over next summer.

In shrubs there are several new things that sound interesting. There is a red weigelia, for instance, known as Bristol Ruby, which has a better form and color than the old sorts and should fill a real need in the shrub border.

New buddleias (butterfly bush) include White Bouquet, described as having long, rounded spikes of pure white, fragrant flowers. It grows five feet high and blooms from July until frost.

Then there is a new forsythia, Spring Glory, said to bear twice as many flowers as ordinary varieties, the branches being literally covered with large pale yellow flowers.

There is a new hardy daphne, Somerset, an English import that has received high honors abroad. Flowering peaches, a new mock orange and a host of other good things, including climbing roses, offer suggestions for every garden and every pocketbook.

NO PICTURES

By ERNEST ROBSON

To the scientists, he's *Nasua narica;* in Nature Magazine (Oct. 1941) he's Senor Suto; to the visitors of a carnival that made mid-western towns last summer he was the famous "WHAT-IS-IT?". Banners outside the tent in which he was displayed proclaimed that he was caught on a farm "near here" after he had killed two dogs and devoured twenty-three chickens. Hundreds of people paid their nickels to see this strange creature, and many were the comments:

"It's a cross between a 'coon and a groundhog".

"It looks like a monkey".

"It's got the nose of a 'possum".

"The man from the conservation department, I hear, says he doesn't have any idea what it is".

All these speculations bother the "coati mundi" not a bit. He keeps on nuzzling the ground for insects or nibbling at the pieces of bread thrown in to him. I paid my nickel with the rest and will admit that I was puzzled at first and did my share of speculating, although my speculations did not run to "crosses" as the common ones did. A camera is my always present companion, so as I left the tent I asked the keeper if he had any good pictures of him.

"No. Pictures might spoil my show".

"I'd use them only as you said I might".

"No, I'd rather not have any pictures".

"Some one might find out what it really was?" I ventured.

"That's right", he admitted as I gave up and walked away.

Then from the back of my mind began to come recollections of something I had seen about such an animal somewhere before. Wasn't it in one of Ivan T. Sanderson's books? Then I remembered quite distinctly one of his drawings that pictured the creature exactly—long tail, pointed nose and all—but I could not remember its name except that it was a primitive member of the raccoon family. Then in just a day or two came the October number of Nature Magazine with the article and pictures of *Senor Suto,* clinching my conclusions. I do not know where the "WHAT-IS-IT?" may be now, probably somewhere garnering nickels.

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NATURE IN PRINT

As a convenience to readers the books reviewed in the pages of Nature Magazine may be ordered through the book department of the American Nature Association, 1214 16th St., Washington, D. C.

(Continued from page 63)

skirmishes that comprise these battles, seem less a matter for dismay and more a simple reason for fortitude when compared in the mind with the ceaseless ebb and flow of life and death that are under all the sea winds. The inspiration seems all the more valid as one appreciates the beauty that Miss Carson reveals and skillfully conveys to her readers—a sense of beauty resulting partly from wonder but also arising from one's apprehension of order and grandeur and the triumph of the continuing species over the loss of individuals.

Miss Carson's volume, which might aptly be called a factual work of creative fiction, is not only descriptive of the lives and habits of many animals of the sea, the shore, and the skies above them, but is also a narrative that makes many of these creatures seem actually to live in her pages, to live not as characters that are made to seem in any way human but as characters that share with human beings the life of this planet. *Under the Sea Wind* can hardly be praised too highly for contemplative enjoyment or for interesting informative reading, which latter is incidentally aided by an illustrated glossary. Its prose is quietly beautiful throughout, so consistently beautiful, in fact, that the book's one possible fault—a virtuous fault, indeed—is that like Swinburne's poetry its prose has a persistent rhythm that pleasantly lulls the attention of readers who are accustomed to varied tempos and surprises in modern prose styles—like a pleasant sea wind without thunderings or lightnings. This seems only a possible fault, however, for it actually can become an enjoyment among current books; *Under the Sea Wind* should be read in separate sessions—say one for each of its three parts "Edge of the Sea," "The Gull's Way," and "River and Sea."

In all of these, as Miss Carson says, the sense of the sea, "holding the power of life and death over every one of its creatures," pervades every page. The first, however, deals largely with birds as its central characters. The last recreates the wonder of the life history of eels. The middle part of the book is an amazingly discerning life-narrative of a mackerel—a sketch that no reader of nature would willingly miss.

"It was indeed a strange world in which to set drift anything so fragile as a mackerel egg," writes Miss Carson. "It was filled with small hunters, each of which must live at the expense of its neighbours, plant and animal. The eggs of the mackerel were jostled by the newly hatched young of earlier spawning fishes and of shellfish, crustaceans, and worms. The larvae, some of them only a few hours old, were swimming alone in the sea, busily seeking their food. Some snatched out of the water with pincered claws anything small enough to be overpowered and swallowed; others seized any prey less swift and agile than themselves in biting jaws or sucked into cilium-studded mouths the drifting green or golden cells of the diatoms."

In this fashion Miss Carson recreates the world of the mackerel, whose life she recounts. Thus also she describes one part of our own universe, which is indeed "a strange world in which to set drift anything." Yet strange as it may seem it is indeed our world, and not all that we can know of its apparent tragedies can end our efforts to understand and enjoy it. As Raymond S. Deck makes plain in his *Pageant in the Sky,* which was reviewed in the December NATURE MAGAZINE, the birds alone can make this world a source of recreation to us and can provide many kinds of enjoyments and benefits, not the least of which is the reading of such books as *Pageant in the Sky.*

Certainly we shall wish to continue our resorts to the inspiration and assurances that can come from such works as these, no matter how troublesome the times, perhaps even more frequently as our living seems more perplexing. Certainly we have not yet exhausted the sources of wisdom that are in our observations of living creatures that share our own struggles. Even in the midst of air-raid threats we can, for one example out of an unknown but suspected many, take some counsel from the song birds.

Living their lives in constant danger from hawks, the dive bombers of the avian world, these small birds have earned a reputation not only as allies to man in his war on insect pests but also as the world's best songsters. In the midst of a flock of birds that are singing, chirping away, and gathering food, one of them suddenly sounds an air-raid signal. Instantly they all take the nearest cover, stay perfectly quiet, and keep perfectly still. The hawk swoops down and passes over. One of the birds sounds an all-clear cheep, and promptly the whole flock is again gathering food, chirping away, and singing. Repeatedly the flock is subjected to such attacks, but just as often these small birds take their precautions and then immediately after the attack resume their business of the hour.

They take air-raids in their stride, an example that we may well follow—and for the sake of such examples, as well as for our many other reasons, we may well continue to attend to our affairs of the outdoors, along with our preoccupations with our own emergencies.

About the Weather

Clouds, Air and Wind. By Eric Sloane. New York. 1941. The Devin-Adair Company. 76 pages. 9 by 12. Mostly illustrations. $2.50.

Many of us are amateur weather prophets, and the weather is ever one of the most common topics of conversation. Man's extension of his sphere into the upper air, both for peaceful and belligerent reasons, has extended both popular and scientific concern for and interest in meteorology. Weather reports in time of war become military secrets, and the usual detailed reports of trends are already missing from our newspapers. We must then try to do the best we can in forecasting for ourselves, and no better guide for the layman, nor one more interesting, could be found than this book. Through full-page pictures of the different clouds and through cartoon-type drawings of other weather forecasting mechanics, the author and illustrator has done a fascinating job in producing the first book of its kind. The accompanying brief text explains things in popular fashion for the layman.

Old Herbal Published

In London, in 1525, the famous herbal of Richard Banckes was published. It was the first herbal in the English language. A modern reprint of this rare work, of which only two original copies are known to exist today, has been issued by the New York Botanical Garden. A complete facsimile of the copy in the British Museum is included in this reprint. Bound in cloth, the book is available from the Garden at $3.50.

Thanks, Dr. Vorhies

In his newsletter of November 11, 1941, to members of the Arizona Wildlife Federation, Dr. Charles T. Vorhies of the University of Arizona, Secretary-Treasurer of the Federation, says:

"While we are congratulating ourselves and boasting of our accomplishments (as a nation) in restoring some forms of wildlife (deer are too abundant in many places) it is well to remember that several species are on the ragged edge of oblivion, and many are gradually declining in spite of over-optimistic reports to the contrary.

"To those honest sportsmen (all too few) who will read and heed sober warnings, and to conservationists generally we commend an article entitled 'Our Endangered Game Birds' in the November issue of NATURE MAGAZINE. The article is by Mr. E. A. Preble, one of the older biologists long with the U. S. Biological Survey (now retired and able to speak without restraint), and a man of wide experience in the field. You and I may well envy Mr. Preble for experiences in the north country, whence came those hordes of wildfowl we may well despair of ever seeing again—though not impossible if we should ever decide to have our cake, and not try to eat it too. From personal contact as well as by his writings we know Mr. Preble to be a cool, calm, judicial type of nature lover, who never becomes excited over the gloomy outlook for so much wildlife, and who knows whereof he speaks when he weighs our wildlife against the modern sportsman, and gives us the answer. If you really want to help conserve wildlife this article is a *must.*

"If time, space and finances permit we may quote at length from Preble's article in the next bulletin, for we know that not nearly enough good folks read NATURE MAGAZINE. 'Twould be great if we could get enough letters—mere cards even—from you who receive this to let us feel the pulse of our organization—if it has a pulse."

Correspond?

Richard A. Edgren, Jr., 4722 Manor Avenue, Chicago, Illinois, is an amateur herpetologist and would like to correspond and exchange specimens with others having a similar interest.

TO THE EDITOR

Wild Flower Laws

Dear Sir:

In your October article on holly you suggested laws as one of the methods by which those interested in conservation might help the situation.

The 5th and 14th Amendments to the U. S. Constitution contain a clause to the effect that no one may be deprived of life, liberty or property without due process of law. Clubs instrumental in passing state conservation laws have held that an owner of property could not pick or cut native plants on their own land if forbidden by the state law, and have given much publicity to that idea. Part of the state laws contain a clause to the effect that the law does not apply to the owner or lessee of the land, and that he may delegate that right to another. A few of the state laws require that any such delegation must be in writing. One state law requires that a copy of such permission must be filed with the town or city clerk.

Several states forbid the picking of wild flowers within 200 or 300 feet of any highway, and on West Virginia highways such notices are extensively posted. The state, however, has no legal control of property that it does not own, and an owner of land within the above limits may do as he pleases with the plants and permit others to do likewise.

The "due process of law" clause has been held by the courts to mean that an owner of land may not be deprived of the use of his land, or materials on it, without payment for such deprivation unless his use constitutes a public nuisance or threat to the health of the community.

In connection with present soil conservation and other similar activities it is recognized that neither the nation nor state can take over private land, or do experimental or erosion work on it, without the owner's permission, unless the owner is paid for such use. It has, however, been suggested that an owner of badly-eroded land washing upon and damaging other public or private property, and who refuses to allow the damage to be stopped, might be sued for such damage and the state or nation might legitimately take corrective measures at the owner's expense. Similarly it might be held that quantities of ragweed or poison ivy constitute a public nuisance and might be abated at the expense of the owner if he refused to do it himself, but such permission of the law would not extend to inoffensive holly and similar plants.

The constitutions of forty-five states prohibit the lending or donating by the state, or any political subdivision, of credit, money or property to or in aid of private persons. So the national government is the only one that can legally make payments to a land owner for depriving him of the use of his land, or plant materials on it, and such payments could hardly be expected to be made for the enforced protection of native plants.

For a state or political subdivision to exercise such control of privately-owned native plants it would have to purchase the land.

However, the taking of holly or other native plants from land without the permission of the owner constitutes both trespass and theft, and if an owner or conservation-minded individuals wish to stop such vandalism they stand a much better chance of obtaining severe judgements under the common law covering these points than under special laws of dubious value and legality.

It is quite probable that in some cases individuals have or may be convicted under illegal state laws, either because the judge or the defending lawyer is not familiar with legal decisions on similar cases, or the defendant does not have sufficient money to carry his case to a higher court, which procedure the amount involved in most cases would hardly justify.

It is the belief of Dr. Edgar T. Wherry and myself (and many others), based on spending from two to three months a year for the past twenty-five years in the field in all parts of the country studying and photographing native plants, that the only tangible and effective method of preserving any appreciable part of our native flora is the establishment of wild flower or general wild life preserves that are given adequate protection, before most of the worth-while areas for such preserves are cleared for other purposes. The bringing of native plants into cultivation plays a very minor part in conservation aims, particularly when most of such material brought into cultivation is obtained from the wild instead of being propagated largely from seeds, cuttings and root divisions.

Washington, D. C.

P. L. RICKER

President, National Wild Flower Preservation Society

Challenges "John Doe"

Dear Sir:

I read with considerable interest your "John Doe" letter published in the November issue of *Nature Magazine*. However, I believe that Uncle Sam is doing a better forestry job than Mr. Doe may realize.

The United States Forest Service administers the resources, etc., of some 176 million acres contained in our 161 United States National Forests. This area embraces approximately one-tenth of our land. This will give Mr. Doe about one and one third acres for his share.

The Forest Service does not limit its concern to the amount of lumber that can be produced on a sustained yield basis. The main forest crops include: lumber, including choice hardwoods for special purposes; grazing pasturage; cordwood for fuel; pulpwood; turpentine and naval stores; recreation—outings, winter sports, hunting, fishing; water; wildlife. We can gather from this list that the work of the U. S. foresters is a complicated and long term job. In the case of wildlife protection, they may find it necessary to leave thick stands of timber in some places. The forests contain both good and poor land. The most scenic places are not usually good for agriculture. In addition the Forest Service issues summer home permits, and provides cached first aid supplies at many danger points of trails, etc.

Past experience has shown that, as a rule, private individuals are not generally as vitally concerned with their own forest lands as they are the dollar sign. The Forest Service has had to take over some of this land that has

(Continued on page 107)

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EXPLORING A NEW WORLD

(Continued from page 68)

hunt the winner received a treasure—a shell or mineral, museum duplicates, for his own. The child may start his own little museum in this way, or take the treasure to school and aid the classroom museum.

The museum reaches many that cannot come to it. This is through the loan extension service that spreads its influence among the schools, libraries and many other organizations. Handicapped children explore for the first time, their wheelchairs and hospital carts moved about by other youngsters or museum guides. Blind children may handle various exhibits as they explore what before had been a world of darkness.

Visiting school classes come by the thousands and keep the staff more than busy during school hours. Frequently school groups come prepared to be bored, expecting something like the "bird lady" who trots out on the stage and "talks down" to her eager young audience about the lovely blue bird that nests in a fence post and lays five bluish-white eggs. Yet a Nature program presented by one who knows and understands both children and Nature will thrill an eager young audience, and give Mickey Mouse and Hopalong Cassidy a run for their money.

Nature lore is so often a neglected subject in school systems, summer camps, and many other places because good Nature teachers with a love and understanding of children are not legion. Miss Mildred E. Manter, able director of the Children's Museum, has surrounded herself with a young and enthusiastic staff of highly-trained men and women, of imagination, skill and understanding of the needs and dreams of youngsters.

Children find in the museum programs and displays a continued source of fun and activity that holds their interest for days, months and years. Those most keenly interested join some of the museum clubs, such as the bird club, Nature trails club, or mineral club, and join in their outdoor activities. Members become acquainted, under expert leadership, with many birds, animals, flowers and insects in their native haunts. With field glasses, binoculars, butterfly nets and geologist's hammers they become real outdoor explorers.

Communities blessed with a children's museum, or a progressive natural history museum, can now offer their youngsters knowledge about the world in which they live. The benefits of this program are open to the young visitor from a home of poverty or from a home of wealth. Perhaps the greatest work is with the underprivileged youngster, but there is no discrimination in this program and any child will find the door wide open and within the walls an atmosphere of love and understanding.

The Jamaica Plain museum has grown from one room with a few exhibits to its present commodious quarters—which attract 200,000 children a year—in the short period of 25 years. One question frequently asked is: even in this short period can we see the effect of the work? Certainly, for children once bitten by the museum bug return after they have grown up and left for work or college.

The editor of *Our Hobbies*, predecessor of the present *Museum Trails*, the children's magazine, is now a Boston newspaper man. A child who was a member of the field club is now with Harvard University's Department of Entomology. A youngster formerly active in the science club of the early days is now an eminent physician in New York City. Three members of the present board of trustees were once "museum children." One of these is a member of the staff of Harvard's Museum of Comparative Zoology, a noted scientist and explorer. His leadership greatly aids the program and he will soon have two of his own children participating in the museum program. The author, who is director of a museum and organizer of two, received his first spark for this work as a youngster in the Boston Children's Museum.

The record of this museum is splendid evidence of the value of this live type of museum. Through it many thousands of children have seen new fields of interest and had new worlds opened to them. They have been given something they will value the rest of their lives; something that will make life richer and more interesting through the years.

THE SPEED OF ANTS

By A. M. REESE

The discussion in *Science*, some time ago, concerning the remarkable speed of flight of a deer fly will be remembered by many. While visiting in a Maryland countryside, the author noticed an ant trail extending for ten or fifteen yards across a closely-clipped lawn and leading up, about ten feet, to a hole in a large maple tree. This promised an opportunity to record the running speed of an active ground insect. The ants were a large black species.

A level and fairly smooth speedway of one yard was marked off and the time required to traverse this distance was taken as accurately as possible without a stop-watch. The speed towards the nest was not appreciably different from that away from the nest, nor could any difference in the speed of the large and small individuals be determined. The average time for the yard for eighty observations was eight seconds; the record time was four seconds.

A good sprinter can run forty yards in four seconds, but how fast could he go if he could run as fast in proportion to his length as the ant? The ants varied in length from eight to ten mm. Taking the larger size for comparison with man, say six feet, the speed required of the latter would be about 1.5 miles a minute or ninety miles per hour, as fast as an average undergraduate would care to drive his car on a good road.

The roughness of the course traveled by the ants, in proportion to their size, was almost comparable to what a plowed field would be to a man. It was noticed that on a fairly smooth stone, that made up about one-third of the course, the speed of the ants was perceptibly greater than on the rougher ground, so that the speed would probably be still greater on a perfectly smooth but not slippery course.

Records were also taken of the speed both going up and coming down the vertical trunk of the tree. The average speed per yard going up was approximately sixteen seconds, and down speed was ten seconds. The rough bark of the tree was as difficult in proportion to the ants' size as would be huge rocks and cliffs on a rough mountain side to a man, so that the speed of the ants is remarkable. Imagine a man climbing a vertical ladder at, say, forty-five miles per hour!

Carolina Fishing

Fishing in the Carolinas. By Philip A. Murray, Jr. Chapel Hill, N. C. The University of North Carolina Press. 1941. 183 pages. $2.00.

This is a book for fishermen—and more. While chapters go into the history and literature of angling, and treat with bait fishing and fly fishing, equal attention is given to the factors causing fish depletion and to the problems of conservation of fish life and the restocking of streams. Finally, a considerable section of the book is given to discussion of the fish species—both game and food fishes—of Carolina waters. The book is well written, with fishing experiences retold here and there.

For Hikers

Suggestions for Appalachian Trail Users. The Appalachian Trail Conference. Washington, D. C. 36 pages. 1941. Twenty-five cents.

This is a second edition of a valuable booklet for any individual hiking over the Appalachian Trail system. In fact it is essential for anyone engaging in more than a short, single-day hike, and would even be useful to those. Copies may be had from headquarters at 1624 H Street, N.W., Washington, D. C., for the aforementioned quarter.

WE'RE FROM IOWA

By M. L. JONES

Iowa's state bird chose Iowa's leading product for a nesting site. The goldfinch chooses to nest in late summer; how late is shown by the accompanying picture. The nest was built after the corn ear was fully developed in August.

A safer place could hardly be found for a nest. Few people wander through cornfields between the last plowing in July and corn picking time in the fall, and cats and other animals are not in the habit of climbing cornstalks. After this nest was deserted the maturing ear became heavy and pulled away from the stalk, almost pulling the nest apart.

Were the birds wise enough to choose exactly the right time to build, or were they just lucky?

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TO THE EDITOR

(Continued from page 105)

been racked by human exploitation. The trees have all been cut. The top-soil has been washed away in resulting floods, muddying the streams that already may be polluted as the result of careless mining operations. Valuable fish, game, and other wildlife cannot survive.

The Forest Service also faces the seasonal fire hazard, and through experience has found that, still, 75% of the fires are of human origin. The Forest Service has to deal with the fraudulent claim situation. Under the guise of mining claims, many seek to open dance halls, taverns, and night clubs. Professor Picard's famous stratosphere flight was staged on National Forest land in South Dakota. Five mineral locations were filed with the intention of charging the flight spectators for the privilege of parking on the land covered by the locations.

In the light of this information, I am convinced that Uncle Sam is doing a good job in United States forestry, and is doing it "for the private citizen".

HAROLD RATCLIFF

Jackson, Michigan

Wilderness Trips

Word from H. Frank Evans, originator and conductor of the Wilderness Trail Trips, tells of an interesting and successful 1941 season. Several members of the American Nature Association followed the trails in the Bob Marshall Wilderness Area. Plans are being made, insofar as one can make plans these days, for 1942, with trips planned into the Selway-Bitterroot Primitive Area. Full details may be obtained from H. Frank Evans, 301 W. Cherry Street, Carbondale, Illinois.

Correction

In our review in the December issue of the splendid series of Harvard astronomy books the price of each of the four volumes reviewed was quoted as two dollars. The price is $2.50, and worth it.

For Dog Lovers

Poor Richard's Dog Yarns. Compiled by Poor Richard. Washington, D. C. Shaw Publishing Company, 1311 G. Street. 64 pages plus 36 illustrations. Paper bound. $1.00.

This is a collection of dog poems and brief prose made by "Poor Richard", whose identity is unrevealed. He states, however, that he has made this compilation and edited this book for "sixteen million dog owners in the United States and others who will think more of dogs after reading these yarns." The illustrations, which are all eight and one-half by six inches, are delightful, all but one coming from the Harold M. Lambert Studios of Philadelphia. The combination makes a book dog lovers will treasure.

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BOOKS

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SOIL DEFENDERS FROM OVERSEAS

(Continued from page 94)

Strawberry clover, *Trifolium fragiferum,* is one of the more recent introductions. Already it is playing an important role in the reclamation of low, wet areas where the water table is close to the surface. Perennial, low-growing, creeping, strawberry clover spreads by sending out trailing stems that root at every joint. Its tolerance of alkali makes it useful in pastures that are too salty for the more common grasses and legumes. It competes successfully against saltgrass, alkaligrass and alkali weed. It persists against salt concentrations as high as four percent. Favorable reports on strawberry clover are coming in from many scattered outposts—Washington, Oregon, Wyoming, Nebraska, North Dakota.

E. A. Hollowell reports for the U. S. Department of Agriculture: "Strawberry clover is a native of the eastern Mediterranean and southern Asia Minor; however, it has been widely and inadvertently spread by man. It has been observed on every continent of the world; and wherever it is grown, the value of the pasture herbage has increased."

One of my favorite erosion engineers is kudzu, erstwhile ornamental "porch vine" of Alabama. Its flowers are pea-shaped and purple, occurring in axillary spikes. Its pods are large and flat. Its vines are hardy—swift couriers of reassurance to worn, rain-gnawed lands. It has been known to race across a field or down a gully at a speed of fifty feet in six months flat! Hogs, cattle and horses thrive on the leaves and stems. Good starch can be made from the fleshy roots, and it is said that the royal family of Japan once wore raiment of a fine weave made from the tough fiber of the inner bark. It propagates best from crowns, seedlings and cuttings.

Kudzu survives from year to year in the South. Although its true worth has been but lately recognized, kudzu is today roping down more than 200,000 Southern acres. It is said that at least 10,000,000 more acres ought to have the protection that kudzu can give. To help meet a demand that is far ahead of the supply, Soil Conservation Service nurseries are steadily expanding the output of seedlings for distribution in the South. This year's production will run between thirty and forty millions.

No comprehensive roll call of introduced plants engaged in soil defense can be essayed in one article. Examples necessarily must be drawn at random and by whim.

Among the introduced trees and shrubs that, in one region or another, for one erosion control purpose or another, are in high favor, we find the acacias, Japanese honeysuckle (for roadbanks only, where it can be strictly controlled), Norway spruce, Scotch pine, Austrian pine, ailanthus, silver maple, Russian olive, Chinese elm, Siberian pea-tree, *Caragana arborescens,* white mulberry, apricot, Japanese chestnut, common matrimony-vine, and Tatarian honeysuckle.

Each of these writes its own chapter in the current diary of soil defense. A shuffling of the pages gives us for momentary examination the interesting *Eucalyptus globulus,* or blue gum. Our subject, now a naturalized Californian, is a native of Australia and the Malayan Peninsula. Eucalyptus, of which there are a vast number of species, has been planted for windbreaks, street shade, ornamentation and timber. The tree is chiefly valuable because of its adaptability to dry sites and eroded slopes.

Farmers have been encouraged by the government to plant eucalyptus for erosion control and for fuel. In California one hundred cords per acre have been produced in thirty-five years, proportionately large volumes in ten to fifteen years. One hundred thousand trees of four species is the annual output of Soil Conservation Service nurseries in California. These trees leave the nurseries in paper pots, one to a container, assembled in "flats" for convenient handling.

The useful range of *Eucalyptus* is limited because it cannot safely be planted where temperatures fall below twenty degrees Fahrenheit.

Having saluted, in turn, the gallantry of introduced grasses, legumes and trees, I am minded to add a postscript. I do so, I suppose, partly because I am intrigued by a name, and partly because I know that amongst plants, as amongst men, there are innumerable individuals carrying on a good fight in vacuous obscurity.

The ice plant has been used by the Soil Conservation Service for roadside and bank plantings in the Pacific Southwest to the extent of 60,000 cuttings during the past year. It is planned to use 100,000 this year. The species are mostly of the broad or large-leafed types: *Mesembryanthemum chilense,* from California and Chile, and *M. edule,* a native of South Africa. The large species are not recommended for vertical planting on highway or other embankments because the top growth becomes heavy and the roots pull out. *M. roseum,* of slower growth, is noted for mat-forming and is sometimes given charge of steep banks and terraces.

Most species of ice plant grow readily from seed or cuttings. Planting may be done at any time of the year. Cuttings usually consist of a matured piece of the branching stem of the parent plant, together with the connecting foliage. Under ordinary conditions, a complete cover is achieved in two years.

Civilizations have fallen when their fertile soils have disappeared. At this very time when the United States is working furiously to assure the survival of democracies across the waters, it is losing down the Mississippi every hour the equivalent of an eighty-acre farm. But the quiet, little heralded war on the home front—the war against erosion—is being prosecuted with quickened intensity. The same democracies that we are supplying with food and ships and munitions—yes, and the same dictator Nations that we are opposing—have provided us the aid of a wide assortment of plants to meet the creeping menace of dust bowl, flood, gully-washing and run-off.

IF YOU WANT TO BE AN ASTRONOMER

(Continued from page 80)

there are less than one thousand active professional astronomers. Which means that when you are finally equipped to do research work, your competition in job hunting will probably be pretty heavy. As a matter of fact, the astronomical positions filled each year in the United States are extremely few.

But college professors, and even high school teachers, frequently combine research with their teaching, and sometimes slide easily from their classrooms into a position at one of the leading observatories, when a staff vacancy occurs. So, if you are wise, you will prepare yourself for teaching, in case there is no room for you immediately in a highly specialized research organization.

As for the practical value of astronomy in this "machine age", at present so thickly covered with war clouds, the question is one which cannot be easily answered in general terms. Perhaps each individual must determine his own personal answer to this kind of a question. Navigators and aviators certainly can testify to the practical value of the science for steering a ship safely through the seas, or guiding a plane in the clouds. Physicists, chemists, and geologists frequently find it valuable to consult astronomers for help in solving some of their most recent and difficult problems. Their work "dovetails" more neatly than is generally realized. National Defense Committees are now making practical use of the specialized ability of noted astronomers. Their knowledge of optics and modern instrumental developments qualifies them as authorities on many important wartime problems.

But if you fume and grow impatient when your efforts cannot be easily tabulated in terms of profit and loss; if you are dissatisfied when you do not see immediate and tangible results—then you certainly should never consider specializing in astronomy.

Experts in this field must, of necessity, develop a capacity for looking at the world with a reasonable amount of detachment. The long-range view is the only kind of vision possible in their work. Pushing back the frontiers of knowledge is no job for a weakling, or for a person intent only on promoting his own immediate personal welfare. For, although the rapid instrumental developments made recently have resulted in tremendous strides forward, the complete and final evaluation of recent progress in astronomy will probably have to be made by future generations.

Certainly the days are past when astronomy was a cool and aloof sort of science, and its exponents were regarded as mystics and dreamers, their heads almost literally "in the clouds". The relation between celestial and terrestrial problems has become an increasingly close one. A modern astronomer must be a well-rounded, well-educated, and extremely competent individual. His rewards, although sometimes intangible and not completely obvious to an outsider, almost invariably bring an immense amount of real personal satisfaction. The work he does is difficult, but extremely absorbing and important.

Honduras Adventure

Jungle in the Clouds. By Victor Wolfgang von Hagen. New York. Duell, Sloan and Pearce. 1941. 260 pages. Illustrated. $3.00.

This is the latest of the travel and exploration books by this author-naturalist, and is the story of the rain jungles of Honduras and a quest for the Quetzal bird of Indian legend. It is a fast-moving story, filled with human interest as well as natural history interest. The author writes well, as readers of NATURE MAGAZINE—who have found his shorter articles within these pages from time to time—well know. *Jungle in the Clouds* is grand reading.

Standardized Plant Names

PREPARED BY AMERICAN JOINT COMMITTEE ON HORTICULTURAL NOMENCLATURE
EDITORIAL COMMITTEE, HARLAN P. KELSEY (Chairman), AND WILLIAM A. DAYTON

A REVISED AND ENLARGED CHECK-LIST OF APPROVED SCIENTIFIC AND COMMON NAMES OF PLANTS AND PLANT PRODUCTS IN AMERICAN COMMERCE OR USE

This is a section of a typical page:

EUONYMUS 219 EUPATORIUM

EUON'YMUS (*EVONYMUS*) [W]
EUONYMUS

There is controversy both as to the spelling of this name and its gender. Linnaeus published this as masculine and in the form Evonymus. The spelling Eu- and feminine gender better conform to classic usage. The spelling Euonymus is now generally accepted and agrees with customary pronunciation. As International Rules now stand, Euonymus seems to be masculine.

acu'tus . . . . . **E. fortunei**
ala'tus . . . . . WINGED E.
—aper'tus . . . . . BLACKSEED W.E.
—ap'terus
¢DWARF (*compactus*) HV. E. alatus
america'nus [W] . . . . . BROOK E.
—angustifo'lius . NARROWLEAF B.E.
aquifo'lium . . . . . HOLLYLEAF E.
atropurpu'reus [W] . . EASTERN WAHOO (*Eastern Burningbush*)

The name E. atropurpureus is sometimes misapplied to E. europaeus a.

bulga'ricus . . . . . BULGARIAN E.
bungea'nus . . . . WINTERBERRY E.
¢MIDWINTER (*semipersistens*) HV.
¢WEEPING (*pendulus*)
echina'tus
europae'us . . . . . EUROPEAN E.
¢ALDENHAMENSIS. HV.
¢BRILLIANT
¢CRIMSONFRUIT (*atroruben-*
¢DWARF (*nanus*)
¢INTERMEDIUS
¢PURPLELEAF (
¢WHITEFR-
fimbria'-
fort-

EUONYMUS japonicus, continued
SILVER VARIEGATED (*argenteo-variegatus*)
YELLOWEYE (*medio-pictus*)
kiautscho'vicus (*patens*)
SPREADING EUONYMUS
lanceifo'lius . . . . . LANCELEAF E.
latifo'lius . . . . . BROADLEAF E.
maack'i . . . . . MAACK E.
—lanceola'ta
macrop'terus (*ussuriensis*)
nanoi'des . . . . . LOW E.
na'nus . . . . . DWARF E.
—turkestan'icus (*E. n. koopmanni*)
nikoen'sis . . . . . NIKKO E.
nippon'icus . . . . . NIPPON E.
obova'tus . . . . . RUNNING E.
occidenta'lis [W] . . WESTERN WAHOO (*Western Burningbush*)
—par'ishi
ores'bius
oxyphyl'lus
pa'tens . . . . . E.
pauciflo'rus
pen'dulus
phello'manus
pla'nipes
pyg'm-
ra-

EUONYMUS, continued
SARGENT E. . **Euonymus sargentianus**
SIEBOLD E. . . . . **E. sieboldianus**
SPINYLEAF E. . . . . **E. ilicifolius**
SPREADING E. . . . **E. kiautschovicus**
WARTYBARK E. . . . . **E. verrucosus**
WESTERN WAHOO . . . **E. occidentali-**
WILSON E. . . . . **E. wi-**
WINGED E. . . . . **E**
WINTERBERRY E. . . . **E**
WINTERCREEPER E. .
YEDDO E. . . . .

EUPATO'RIU-

agero-
al-

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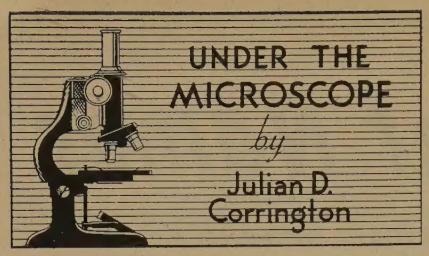


METALLOGRAPHY

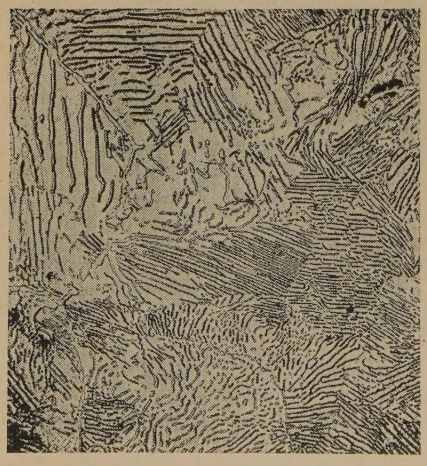
III. STUDY OF SPECIMENS

The purpose of studying polished and etched surfaces of metals is to determine the minerals present and the size and distribution of their crystals. This information is of utmost importance in the metal industries, and accordingly the larger companies employ microscopists who have had training and experience in this specialized field.

One of the ends sought is control of the manufacturing processes, an outstanding example being the heat treatment applied to the various steels, on which depend many of the qualities desired. The problem of adulteration is another; even very small amounts of foreign elements radically altering the behavior of a given metal when in use. Again, there is the post-mortem study of fractures in metals with a view to prevention of similar errors in the future, while alloying is a fourth important consideration.

The subject is far too intricate for broad coverage in a single article, and an example or two will have to serve. Inasmuch as steel is at once the most important and most complex of all metallic substances used in our modern world, let us see what the metallographer has to say about its manufacture and employment.

Steel, as everyone knows, is an alloy and not a single metal or metallic element. The chief ingredient is iron, which, in pure form, is an element and is silvery white and relatively soft. Iron possesses the desirable properties of malleability (can be shaped by hammering or rolling) and ductility (can be drawn out into a wire), but is very easily oxidized (rusted) or attacked by corrosive agents, and these are undesirable attributes. Iron is also strongly attracted by magnets, a feature that may be desirable or otherwise, according to the requirements of the particular use intended.



PEARLITIC STRUCTURE IN HOT-ROLLED STEEL. THE BANDS ARE CEMENTITE, THE REMAINING SUBSTANCE FERRITE. NITAL ETCH

In addition, simple steel contains small percentages of carbon—by intention—and silicon, sulphur, manganese and phosphorus as impurities; alloy steels are made by adding to simple steel varying amounts of one or more such metals as nickel, chromium, manganese, vanadium, molybdenum, and still others. Most remarkable are the differences that seemingly insignificant quantities of these alloying substances, especially carbon and nickel, impart to the finished product.

Most steels have less than 1% carbon, and none of them more than 2.2%. This element confers hardness and tempering qualities. Addition of 3.25% of nickel to a 0.5% carbon steel makes the resulting metal very fine-grained, elastic and ductile, while chromium produces an exceedingly hard steel. Chrome-nickel steel, combining the properties of both added metals, gives a product that is at once hard, tough, and elastic. Manganese steel is hard and either brittle (5% manganese and cooled slowly) or tough (12% and cooled rapidly), while tungsten steel will retain its properties even at a dull red heat, and is hence much in demand for high-speed tools. And so the story goes, with new alloys and discoveries about them ap-

PEARLITIC STRUCTURE AND GRAPHITE FLAKES IN CAST IRON

pearing continually with new developments.

Such manufacturing processes as casting and rolling have their effects, while the heat treatment is especially important. The particular temperature to which the mass is raised, how long held there, and the method of cooling, whether slowly, as in molten lead or in a furnace, or more rapidly, as in a current of air, or very quickly by quenching in water, brine or oil, have much to do with the final properties. The objects of such treatment are to control the grain size of the metal, the character and dispersion of the carbon, and thereby the hardness and toughness of the product.

Taking a particular case, in the manufacture of a file hardness is the most important quality, and depends on the proportion of carbon present. Here one would want a high-carbon steel, for instance 1.3% of carbon. Further, the carbon must be dispersed throughout the iron to the fullest possible extent, making the mixture uniform, and its particles must be submicroscopic in size to effect this complete dispersion. Such an alloy will be equally strong throughout and unlikely to fracture or otherwise exhibit any defects. The more carbon available for dispersion, up to a certain point, the more minute particles present everywhere and

BRASS, POLISHED AND ETCHED SECTION

hence the greater and uniform hardness.

When this mixture is heated to 800° C., the carbon goes into solution and disperses readily; then the metal must be cooled rapidly by quenching so that the carbon does not have time to separate out into visible carbide grains. When cold, the steel is too rigid for such separation to be possible. Similarly, a soft steel may be manufactured, as for use in making wire or nails, by adding only 0.1% carbon to the iron and cooling slowly, as in a furnace. Then all of the carbon particles crystallize out of the solution into large carbide grains; these are hard but are interlaminated with soft iron.

The microscopist enters the picture in testing and controlling the product, and therefore modifying the alloying and heat treatment if these are not adequate for the case in hand. Pure iron grains, seen in examining a polished and etched section of a given steel under the microscope, are termed *ferrite* and are white and homogeneous. In a cast iron, the carbon content of which is very high (3.5 to 4.25%), and lacking heat treatment, the carbon separates out completely in the form of large flakes of *graphite,* which appear as black bars and streaks through the section. Such flakes lower the strength of the iron greatly, making planes of easy cleavage in the brittle metal.

When heat treatment is added to cast iron, some of the carbon may form graphite flakes but the remainder will precipitate as carbide, in the form of *cementite* crystals. These occur in plates or laminae, alternating with clear areas of ferrite, a type of construction called *pearlitic.* One of our illustrations shows pearlitic structure in hot-rolled steel, exhibiting no free carbon and a satisfactorily uniform dispersion and grain size of the cementite crystals. Another shows pearlitic structure (often called "pearlite") in cast iron, with relatively large areas containing no cementite and, in addition, large graphite flakes. Needless to say, the steel is the more uniform and less brittle of the two and would be very much preferable for most usages.

Brass, an alloy of copper and zinc, shows much larger crystals than steel, a section appearing like a cubist's dream of heaven. Here again, proportion of ingredients, presence of impurities, rolling, and heat treatment all affect the factors of malleability, ductility, tenacity, hardness, resistance to corrosion, conductivity of heat and electric currents, and still other properties. Grain size is important

and is controlled by metallographic examination. Sizes of the crystals shown in our illustration, for example, are too large, and indicate unsuccessful annealing, the temperature used being too high.

Those finding this subject interesting can go farther into it without difficulty. Consult first a number of articles in a standard encyclopædia, as those on *metallography, iron, steel, copper,* and *smelting.* Then secure a volume or so on metallurgy and metallography from your local library. Especially recommended for advanced study in connection with microscopy are:

Hoyt, S. L., *Metallography,* 2 vols., McGraw-Hill, N. Y., 1920. Sauveur, A., *The Metallography and Heat-Treatment of Iron and Steel,* McGraw-Hill, N. Y., 1935.

BIOLOGICAL LABORATORY MANUALS

II. Zoology

For introductory remarks and a discussion of the purpose of this series, see the preceding (January) issue.

In the field of general zoology, two teaching methods are evident in the available manuals for laboratory work. In one, the author puts a volume in the hands of the student that includes not only laboratory directions proper, but textbook material as well, believing that coordinated and fully rounded information is essential. In the second type, the information provided is scanty, being essentially an outline of what is to be discovered by the student, along with sufficient instruction on procedure, but no discussional material. Here the aim is to make the student do the work of correlation and amplification. In short, tell him everything and spoon-feed him, in the hope that some of the information will seep in; or tell him little but prod him to find out for himself by suitable outside reading.

Obviously, the first book uses up a considerable part of the laboratory period in reading; the second conserves this time for work of a strictly laboratory nature. On the other hand, the first *does* provide adequate instruction, while the second runs the chance that the student will, of his own initiative or through pressure of quizzes, perform the necessary home work. One form of manual will function best with a certain kind of student, the other with different students, and since no class will be homogeneous in this respect, it remains a question of opinion as to the most effective form of manual. As to the independent worker, for whom this series is, in part, intended, he had best analyze himself as to which type of manual is likely to do him the most good in his planned career of self-instruction.

The larger form of manual is intended to supplement and not to replace a good textbook, but there will inevitably be a considerable duplication of material. Among the best known and most widely used of these is Dr. Libbie H. Hyman's *A Laboratory Manual for Elementary Zoology,* a cloth bound volume of 150 pages (University of Chicago Press, $2.50). By contrast, two equally well known but terse manuals that provide excellent drill in the laboratory essentials and little else are Hargitt and Hargitt, *Outlines of General Biology* (a zoology manual in spite of the title) and Richards, *A Laboratory Guide in General Zoology,* both of them small cloth bound books, brief, published by Lea & Febiger, and now out of print, though still obtainable for individual use from second-hand dealers.

More recently a second controversy as to the functions of such manuals has centered around the question of whether the student should make his own drawings or have them provided for him, in whole or in part. Proponents of the first school believe, with Agassiz and Huxley, that "the proper eye for a naturalist is the point of a pencil" and that the student will never actually get down to details on his specimen until forced to draw them. Opponents take the stand that the science laboratory is not the place to teach the gentle art of drawing and that so much time is taken up in attempting to turn out a good-looking drawing that the specimen is neglected and no opportunity remains for experimental or demonstrational work.

A very popular example of the first school is the *Laboratory Directions in General Zoology* of Curtis and Guthrie, of the University of Missouri, accompanying a companion text (Wiley, 3d edition, 1939, $1.50), a comprehensive board-bound volume. The instructions are strictly of the laboratory type, and while illustrations are provided and make the directions all the more easily understood, they are not the ones the student is required to submit. For example, in the arterial system of the frog, a lateral view is given, showing the arrangement and distribution of the principal arteries in relation to body regions and organs. The student is asked, however, to make a drawing from the ventral view, and cannot possibly do so from the illustration provided, which only aids in the study and locating of vessels, as it is intended to do.

Next in order comes a variety of manual typified by the *Laboratory Studies in Zoology,* of Reed and Young, Cornell professors (McGraw-Hill, $1.00; plates, $0.60). Here the drawings are provided separately from the book so that their use is optional with the instructor. Some are in outline, to be filled in and labeled, others are complete and require labeling only. In this method the most difficult but least significant part of drawing is done for the student—the outlines and proportions of parts, or such intricate and time-consuming subjects as the frog skeleton or the external lateral view of the grasshopper.

The newest manuals, by contrast, go more or less all out for complete drawings, even fully labeled ones. Dr. Karl Stiles' (Coe College) *Laboratory Explorations in Animal Biology* (Burgess, Minneapolis, $2.50) is a large planographed volume with rag covers and spiral wire binding. It contains the usual directions for dissecting and identifying parts, and also tables to fill out, excellent instructions on using the microscope, making drawings, performing dissections, and the like; review problems, outside assignments, and questions to answer. The student is asked to make certain drawings of his own; in other cases outlines are furnished, and in still others complete drawings which need only titling and labeling. These sheets are on heavier paper and are perforated, to tear out and submit. There are also studies in heredity, taxonomy, ecology and other topics too often omitted, plus a bibliography and glossary.

A two-volume publication is the *General Zoology Laboratory Guide,* by Professor J. E. Wodsedalek, of the University of Minnesota. This is likewise planographed, with rag covers and spiral wire bindings (Burgess, $2.90 the set). The bulk is occasioned by use of good quality paper throughout, material on one side only, and numerous blank pages for student-made drawings, which, with the printed drawings, are perforated, to be torn out or left in as desired. The most unusual feature is that of providing the student with well executed and completely labeled drawings, in certain cases, of the same subject and view he is asked to draw for himself. Sometimes a cross section at one level is provided in full, with two others, at different levels, in outline only, to be completed by using the first as a suggestive model. At still other times, no such aids are given. The student gets sufficient practice in making original drawings, but does not have to do all of them in the customary course through the animal phyla.

A good compromise is effected in the newest volume on the market, the third edition of Guyer and Hellbaum (University of Wisconsin), *Laboratory Outlines for Animal Biology* (Harper, $1.50), accompanying a text by the senior author that was reviewed in this department in the issue of last December. Printed and cloth bound, this book follows laboratory material with questions and topics for discussion, provides blank pages for drawings the student is to make, as well as outlined drawings to complete, and occasionally fully finished ones to label; all according to difficulty of the various subjects. There are also a number of tables to fill in.

Teachers of the subject who are unfamiliar with any of the last three of the manuals here considered should inspect them for new ideas and trends. As for the individual working alone, we would recommend Stiles, Guyer & Hellbaum, Hyman, Curtis & Guthrie, and Wodsedalek, in that order, as most suitable. As we have said before, if the independent student can submit his finished laboratory work book to some experienced friend, as a teacher, for criticism, he can be more certain that his accomplishments are of the right order of merit, and his methods correct.

Next subject in this series: botany laboratory manuals.

Amateur Entomologists

The Amateur Entomologists' Society in England seems to be carrying on in spite of present conditions, even though with a curtailed program. We are recently in receipt of letters and reprints from the Honorary Editor, B. A. Cooper, Department of Agriculture, The University, Leeds 2, Yorkshire, England, together with a copy of their journal, Vol. 5, No. 38, 1941, of *The Amateur Entomologist,* stating that British amateurs would like to correspond and exchange with Americans having similar interests. Under present laws, no moneys may be sent out of the British Isles, but they are permitted to ship books, journals, reprints, specimens, and the like, in trade for items they desire from our side. The Editor writes:

"We used to issue six printed *Journals* in the year as well as nine duplicated *Bulletins,* for an inclusive membership fee of 5/-. Owing to the paper shortage, these are now greatly curtailed, like our members' spare time for collecting, and we issue but one larger printed *Journal* per year, as well as half a dozen *Bulletins.* The latter are not likely to be of great value abroad except to those wishing to exchange specimens, but

I suggest that any Americans wanting correspondents over here should send me their wants and I will put these in the next *Bulletin* whether they are members or not.

"The 1941 *Journal* (Vol. 5) is priced at 4/6d (about $1.00) and the 1942 issue now in preparation will be the same price. Vol. 4 (1939) is still available at 2/6d (50c), but earlier issues are out of print though I might be able to get one or two series second hand for libraries. International Money Order (English currency) is probably the best mode of payment, though I personally, wanting a number of American books on biology, would prefer payment in kind, reimbursing the Society myself.

"We are especially interested in learning of your *methods* of collection, breeding, mounting, and so on, to learn if we can pick up any new methods or improvements to our apparatus and technique. Our 1942 issue is to contain articles, among other things, on the breeding and collection of the various groups of the order Hymenoptera, as well as on insect photographic methods, and the breeding of the larger silkmoths (none of them British). Any notes your readers would care to send on American aspects of these problems would be more than welcome, especially on the rearing of silkmoths, which has not been much studied in England."

The *Journal* at hand (Vol. 5) is printed, has 64 pages, and is illustrated with both drawings and photographs. There are 25 different articles on subjects ranging from collecting, preparing, mounting, genitalia study, and photography, to habits, ecologic observations, breeding, type descriptions, and book reviews. Entomologists will find much of interest in this number, even though some of the species discussed are local. Mr. Cooper will send a four page leaflet on beetle collecting to any of our readers who write him. He hopes this pamphlet will stimulate some of us to reply by sending in some of our methods.

Now then, Microfans—an excellent opportunity. How about it?

TRADE NOTES

In the current issue of *The American Biology Teacher* (Vol. 4, No. 3, Dec., 1941), Prof. J. P. Givler, of the Woman's College, University of North Carolina, makes the suggestion that in postwar times microscopists will be able to study living microcultures shipped from any part of the world. He has taken large test tubes and filled them about two-thirds full of sea-water, to which 10% or less by volume of green algae (*Ulva, Enteromorpha*) and a much smaller amount of marine animal life is then added. Even small sea anemones, mollusks and nereid worms can be used. The tube is then tightly corked, and if kept in the light daytimes so that photosynthesis can occur, these tiny balanced aquaria will thrive for two to three months without further attention. Denizens may be studied through the tube walls with a low power lens, such as a 10X.

New catalogs: General Biological Supply House, Inc., 761-763 East 69th Place, Chicago, *Fossils—Rocks—Minerals;* 24 pp., illustrated.

Ward's Natural Science Establishment, Inc., 302 Goodman St. N., Rochester, N. Y., *Comparative Germ Layer Formation in Chordates,* as illustrated by the Mueller-Ward models; 19 pp., illustrated. This is the manual of instruction accompanying the models; may be purchased separately for student use, in lots of 12 or more, at 25c each. Very well done.

Those having access to a copy of Bausch & Lomb's *Educational Focus,* Vol. X, No. 2, Fall, 1939, may be interested in reading the short article on "An example of metallographic research in the manufacture of scientific instruments," in connection with our introductory story of the purpose of metallographic studies in the present issue.

Readers interested in the general topic of dairy bacteriology and study of milk should consult an article by Charlene Brannon, *Quality Milk,* in the December, 1941, issue of *The Science Counselor* (Vol. VII, No. 4). This is a publication for teachers of science in Catholic high schools, issued by the Duquesne University Press, 901 Vickroy St., Pittsburgh, from whom a single copy may be obtained for 35c if the journal cannot be located in any library to which you may have access. Miss Brannon gives an excellent discussion of the history of improvement of quality in milk and how such a high quality as we have today is maintained.

Two A.S.A.M. members have recently contributed articles to scientific journals. Sergio P. Acena, President of the Washington Chapter, Seattle, writes in Vol. 75, No. 3, July, 1941, of *The Philippine Journal of Science* (Manila) on "Preliminary Notes on a Trematode with Two Yolk Reservoirs and a New Species of Lecithochirum," a brief but well written and illustrated paper on technical aspects of parasitology. The Rev. Paul E. Kuehne, St. Peter's College, Muenster, Sask., Canada, has sent us a copy of his recent comprehensive study of the phytoplankton of a number of Canadian lakes in which he lists species present and gives accounts of distributional factors; an important paper for those interested in this phase of botany.

A new book, especially suitable for readers of this department is *Human Anatomy and Physiology,* by Millard and King. Intended primarily for the instruction of nurses, this volume goes into sufficient detail for everyone save medical students and at the same time avoids the great amount of detail generally associated with the subject. If you need a reference in this science in connection with personal studies, teaching, background for microscopy, or similar purpose, we can heartily endorse this book.

The contents are organized into five major units; the body as a whole, the erect and moving body, metabolism, reproduction, and integration and control by the nervous system. Architectural plans that are frequently repeated in the body are stressed in developing the unity of design, and basic physiological principles are applied throughout. Beginning with fundamental organizational units, as cells and tissues, and general processes, as osmosis, each system is developed in logical functional sequence. We especially like the treatment of muscles, where in each muscle is presented as moving a part of the skeleton and opposed by one or more antagonists, rather than the usual method of taking up the muscles in regional groups. The style is excellent and the illustrations very good; of the 285 figures, 28 in color, there are 145 originals by Lucille Cassell and these are very fine indeed. We found the six colored drawings of the skull especially noteworthy. Pp. vii, 525; figs. 285. W. B. Saunders Co., West Washington Square, Philadelphia, 1941. $3.00.

As detailed in the preface to *Plants and Man,* by Hylander and Stanley, the authors propose a volume on botany that dispenses with traditional presentation and much of the customary technical detail of plant morphology and physiology. The book is written for college students who have a general interest in botany and who need a survey of fundamentals, but who would find too much detail uninteresting or even repellent, and who do not plan to major in any biological field. We agree that the book is well suited for those who will teach Nature study and general science, and suggest it also for the layman who would learn something about plants but is not concerned with a heavy dose of morphological material.

The first five chapters take up differences and relationships between plants and animals, evolution and classification, and general biological properties of plants. The remaining 22 chapters constitute an economic botany, stressing the relations of plants to man, and are very well written; complete, detailed, interesting. The numerous illustrations are nearly all original; the drawings average very good, the photographs fair, and the photomicrographs very poor. Pp. x, 518; frontisp., figs. 308. The Blakiston Co., 1012 Walnut St., Philadelphia, 1941. $3.00.

Bausch & Lomb have a lively new house organ for members of the organization, entitled *Balco News.* The latest issue to reach our desk has a full page of pictures showing exteriors and interiors of the plant made at night, showing operations going on at full speed on the night shift.

In *Science for the Citizen,* No. 7, Nov., 1941, a publication of the Maryland Academy of Sciences, 2724 N. Charles St., Baltimore, organization of a Junior Academy is announced. Any group of five or more boys or girls may obtain a sponsor, a place for meetings, and then apply for membership. Club programs are broad enough to embrace all interests, biological, physical and chemical. There will be a special and well equipped laboratory provided, and members will participate in scientific congresses and fairs, put on shows and radio broadcasts, and attend lectures and motion picture exhibits.

Starting in August, 1937, this Department of Nature Magazine is now four and one-half years old. During that time it has, judging by reader response, been notably helpful and informative to many. In that period it has launched the highly-successful American Society of Amateur Microscopists, which now numbers more than one thousand members. The continued service of this department, however, depends fully as much on its readers as on the outstanding ability of its editor, Dr. Corrington, to provide the material in it. The micro-fans are, therefore, again urged to present any criticisms they may have, make any suggestions that occur to them, and, of course, to make use of the advisory service of this department. EDITOR, NATURE MAGAZINE.